Colorado River Basin Salinity Control Program
Federal Accomplishments Report for Fiscal Year 2009

Presented to

Colorado River Basin Salinity Control Advisory Council

by

United States Department of Agriculture
Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Geological Survey
Bureau of Land Management
Bureau of Reclamation

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Colorado River Basin Salinity Control Program
Federal Accomplishments Report for Fiscal Year 2009
Acronyms and Abbreviations

Advisory Council	Colorado River Basin Salinity Control Advisory Council
ASCS	Agricultural Stabilization and Conservation Service
Basinwide Program	Basinwide Salinity Control Program
BLM	Bureau of Land Management
BSP	Basin States Program
CAP	Central Arizona Project
CRBSCP	Colorado River Basin Salinity Control Program
CRSS	Colorado River Simulation System
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
FAIRA	Federal Agricultural Improvement and Reform Act
FOA	Funding Opportunity Announcement
Forum	Colorado River Basin Salinity Control Forum
FSRIA	Farm Security and Rural Investment Act
FY	Fiscal Year
GGNCA	Gunnison Gorge National Conservation Area
GIS	Geographic Information System
HDB	Hydrologic Date Base
NCA	National Conservation Area
NIWQP	National Irrigation Water Quality Program
NRCS	Natural Resources Conservation Service
Reclamation	Bureau of Reclamation
RMP	Resource Management Plan
Service	U.S. Fish and Wildlife Service
TDS	Total Dissolved Solids
TMS	Technical Modeling Subcommittee
USDA	United States Department of Agriculture
USGS	U.S. Geological Survey

UVWUA	Uncompahgre Valley Water Users Association
Work Group	Colorado River Basin Salinity Control Forum's Work Group

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The Natural Resource Conservation Service (NRCS) of the United States Department of Agriculture (USDA) conducts Colorado River Basin Salinity Control activities primarily under the authorities of the Environmental Quality Incentives Program (EQIP). EQIP was enacted with passage of PL104-127, Federal Agricultural Improvement Act of 1996, a.k.a. "1996 Farm Bill."
EQIP has been reauthorized twice; by PL 107-171, The Farm Security and Rural Investment Act of 2002, the "2002 Farm Bill" and by PL 110-246, The Food, Conservation, and Energy Act of 2008, the "2008 Farm Bill." The 2008 Farm Bill expires September 30, 2012.

Through EQIP, NRCS offers voluntary technical and financial assistance to agricultural producers, including Native American tribes, to reduce salt mobilization and transport to the Colorado River and its tributaries. Within the ten approved salinity project areas, producers may be offered additional financial incentives to implement salinity control measures with the primary goal of reducing offsite and downstream damages and to replace wildlife habit impacted as a result of the salinity measures.

In Fiscal Year (FY) 2009, $18.2 million of appropriated EQIP funding was allocated for financial and technical assistance to agricultural producers in project areas in Colorado, Utah, and Wyoming.

New Projects and Investigations

Green River, Utah
The U. S. Geological Survey (USGS) estimated that the annual salt load from irrigated agriculture in the areas near the town of Green River to be 15,700 tons. "Hydrology and Water Quality in the Green River and Surrounding Agricultural Areas near Green River in Emery and Grand Counties, Utah, 2004-2005." The NRCS developed an on-farm/off-farm salt budget and evaluated several treatment alternatives. These evaluations are detailed in the "Colorado River Salinity Control Program – Green River, Utah Unit – Environmental Assessment – Emery and Grand Counties, Utah, August 2009. Several alternatives were presented. The preferred alternative (and proposed action) would implement 2,080 acres of improved irrigation application systems to reduce the annual salt loading to the Green River (hence, the Colorado River) by 6,540 tons by the use of the EQIP with potential assistance from the Basin States program. A Finding-of-No-Significant Impact (FONSI) was published in September. NRCS anticipates offering financial and technical assistance to producers in the unit in fiscal year 2010.

Figure 1 Salt-damaged fields near Green River, Utah

Plateau Creek, Colorado

Fifteen miles upstream from Grand Junction, Colorado, is the mouth of Plateau Creek that drains an intermountain basin north and adjacent to the Grand Mesa. The community of Collbran serves this agricultural region of about 30,000 acres of irrigated hay and pastureland. A significant portion of the irrigation water supply is stored in Vega Reservoir and other small reservoirs and is transported by open, earthen canals and ditches. The Bureau of Reclamation constructed the Collbran Project to provide supplemental water to about 19,000 acres and full water supplies to another 2,500 acres. Investigations are being conducted to determine the salt loading from this area to the mainstem of the Colorado River. NRCS and the Colorado State Conservation Board conducted a pilot program in 2009, providing financial incentives proportional to salt control.

Figure 2 – Earthen canal in Plateau Creek Area

Areas Beyond Current Project Boundaries

Small, but widely scattered farms and ranches of irrigated pasture and hayland are found in the basins of major and minor tributaries of the Colorado, Green, and San Juan rivers. In the aggregate, these areas are likely to contribute significant salt loads. NRCS, in cooperation with the USGS, the Colorado State Conservation Board and local conservation districts, is attempting to evaluate the contributions from these areas using the USGS-supported SPARROW model. Early indications are that loads from 1,000 to 2,000 tons annually may originate from these areas.

NRCS Colorado is undertaking to include about 15,000 acres of irrigated lands in Ouray County into the Lower Gunnison Project Area. The original Lower Gunnison study considered these lands and their salt load contribution, but the selected alternative did not include Ouray County. The Ouray County Commissioners and the Shavano Conservation District have petitioned NRCS to incorporate these lands into the Lower Gunnison project and provide similar financial and technical assistance.

McKinnon–Lone Pine-Burnt Fork, Wyoming

The headwaters of the Henry's Fork (of the Green River) have provided rich resources, first for Native Americans, and then for immigrants who settled and introduced ranching and agriculture.

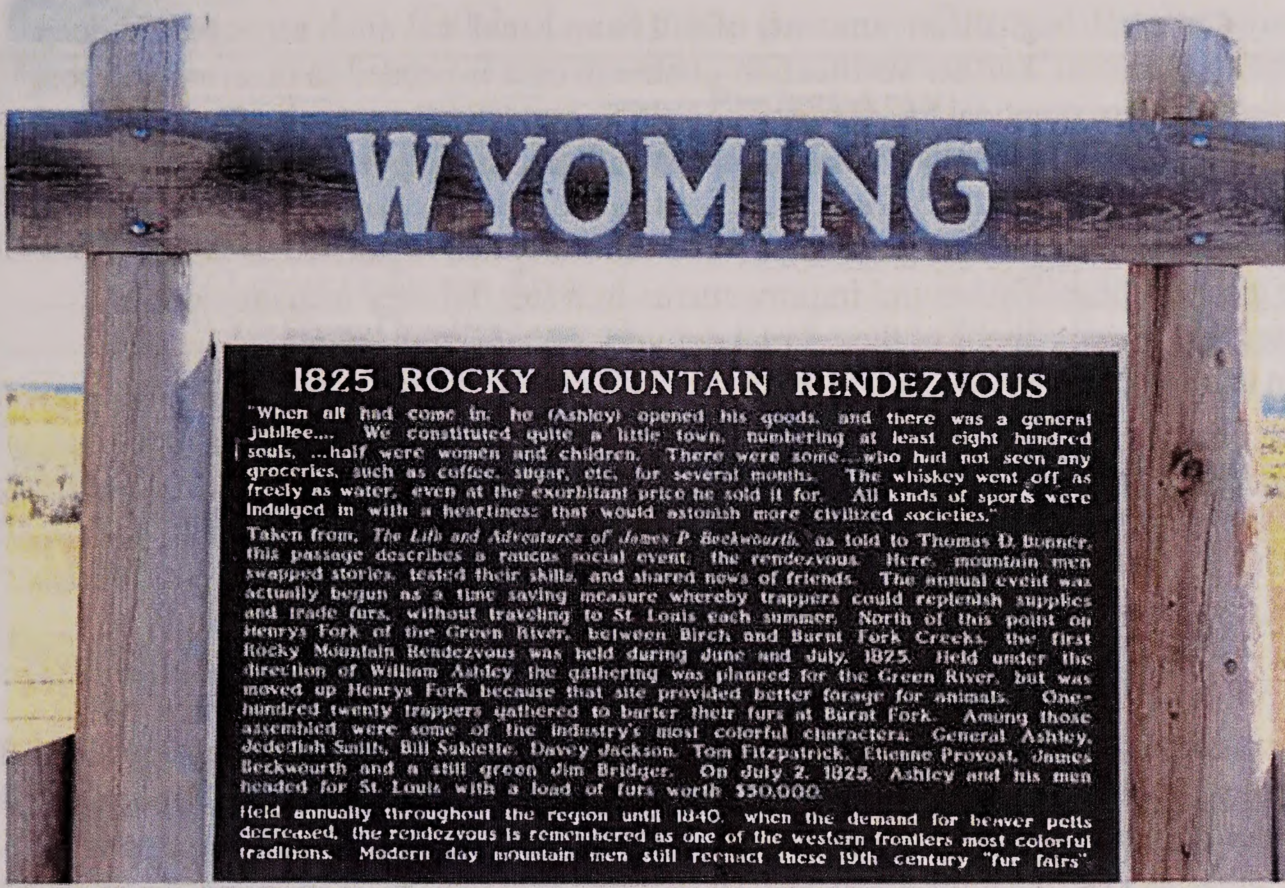


Figure 3 – Historical marker overlooking the irrigated crop, and haylands along the Henry's Fork.

About 20,000 irrigated acres (15,000 acres in Wyoming and 5,000 acres in Utah) contribute a significant salt load to the Henry's Fork River. Farmers and ranchers in this area have seen the improvements occurring in the adjacent irrigated areas around Manila, Utah, and have expressed their desire to implement a project. Initial water quality sampling during the 2008 irrigation season suggested that further investigation and planning is warranted. USGS is assisting the NRCS to analyze stream gage and "grab-sample" data. NRCS is inventorying and analyzing the area and determining if practical treatment alternatives can be indentified. Local landowners have expressed interest and have been motivated by progress in the adjacent Manila-Washam Salinity Project Area.

Figure 4 – Irrigated fields along Henry's Fork.

West Blacks Fork, Wyoming

An area of some 28,000 acres of irrigated pasture and hayland near Lyman, Wyoming, contribute salt to the Blacks Fork River, tributary to the Green River. While a large portion of the geology contributes little

salt, about 10,000 acres may contribute significant amounts of salt from canal and ditch seepage and deep percolation from water applied to fields. Further verification of stream data is needed to determine if cost effective salinity control measures are practical. Reclamation, NRCS, and USGS are reviewing historical data to better characterize the salt "pick-up" values from the areas with treatment potential.

The Wyoming Water Development Commission granted $110,000 to study and organize the Wall and Austin Canals towards the goal of consolidation and improvements in water delivery management. NRCS-Wyoming anticipates that improvement of these large delivery systems will enable extensive implementation of on-farm salinity control.

San Juan Basin, New Mexico and Arizona

In the 1990's, a salinity study indicated that the Fruitland, Hogback and Cudei Irrigation Districts contribute an annual load of 157,000 tons of salt to the San Juan River. "Salinity Verification – Phase 1 Final Report, San Juan County, New Mexico, July 1993".

The San Juan River Dineh Water Users, Inc. (SJRDWU) has entered into a cooperative agreement with Reclamation to pilot the replacement of an earthen-lateral with pipeline. NRCS Arizona is working with the SJRDWU and local farmers to provide financial and technical assistance to connect to the pipeline and install improved irrigation systems to reduce salt loading. Reclamation and NRCS Arizona are also cooperating in acquiring a native-speaking engineer who can provide timely design and management assistance to the pilot. If this small endeavor is successful, the opportunity exists for significant salinity control as the loads in this geology are relatively high and considerable acres exist that could be treated.

Monitoring and Evaluation

Project offices continue to monitor and evaluate the effectiveness and quantity of salinity control, wildlife habitat, and economic performance replacement in order to improve overall performance and management of the program. Generally, the program continues to function effectively and economically, though the overall cost per ton of salt control rose sharply in some areas in 2009. It is also noted that additional efforts are needed to identify and implement valuable, low-maintenance, sustainable wildlife habitat replacement. The individual Monitoring and Evaluation reports for each project can be found on the world-wide-web at http://www.usbr.gov/uc/progact/salinity/index.html

Status of Implementation

USDA-NRCS is providing technical and financial assistance to landowners and operators to implement on-farm salinity control measures in nine approved project areas in three Upper Basin states.

Table 1 – Active Salinity Control Projects

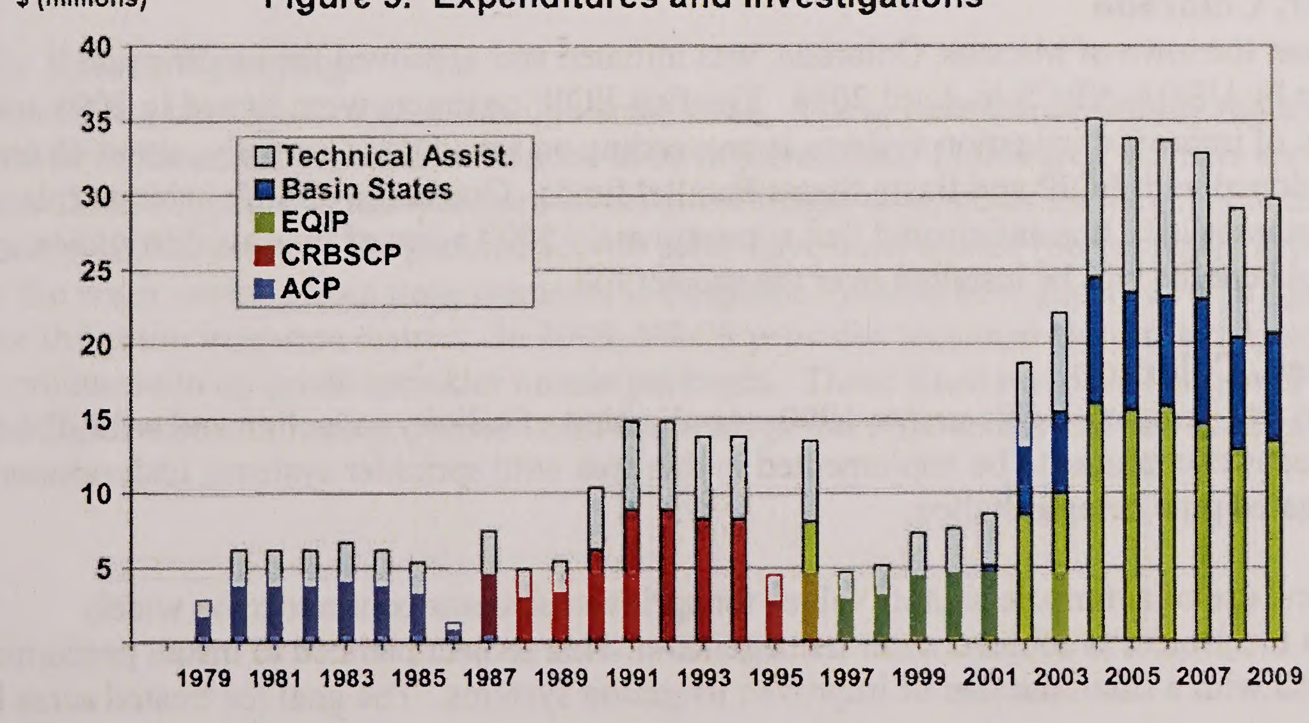
State	Project	Project Area (Potential Irrigated Acres)	USDA Servicing Office
Colorado	Grand Valley	60,000	Grand Junction
	Lower Gunnison River	171,000	Delta and Montrose
	McElmo Creek	29,000	Cortez
	Mancos Valley	11,700	Cortez
	Silt	7,400	Glenwood Springs
Utah	Uinta Basin	226,000	Roosevelt, Vernal, Ft. Duchesne
	Price/San Rafael Rivers	66,000	Price, Castle Dale
	Muddy Creek	6,000	Castle Dale
	Manila-Washam	8,000	Vernal
Wyoming	Big Sandy River	18,000	Farson

Existing Projects

Progress in implementing the various projects is controlled primarily by annual appropriations, supplemented with funds from the Basin Parallel Program. From 1987 through 1995, the Colorado River Basin Salinity Control Program (CRBSCP) received dedicated annual funding. The Agricultural Conservation Program (ACP) administered by the Agricultural Stabilization and Conservation Service (ASCS) provided cost-share assistance to land users through long-term agreements. Technical assistance to land users was provided by the Soil Conservation Service. In 1995, Public Law 103-354 authorized the reorganization of several agencies of USDA. The ASCS was reorganized as the Farm Service Agency. The SCS was reorganized as the NRCS. Financial administration of the CRBSCP was transferred to the new NRCS.

The Federal Agricultural Improvement and Reform Act (FAIRA) of 1996 (Public Law 104-127) combined four existing programs including the CRBSCP into the newly authorized EQIP. In FY 1997, Reclamation began on-farm cost sharing from the Basin States funds that would parallel and supplement the EQIP. For every $1 of USDA funds allocated to salinity control in the authorized project areas, approximately 43 cents is made available from Reclamation's Basin Funds account for additional financial and technical assistance.

Figure 5. Expenditures and Investigations



In 2009, about $30M was directed towards salinity control measures, plans, and investigations in Colorado, Utah, and Wyoming. These funds were the combination of EQIP; cost share from the Basin States Parallel Program; and expenditures for investigations, contract servicing, and monitoring and evaluation.

Grand Valley, Colorado

Implementation has been underway in this unit since 1979. The application of salinity control and wildlife habitat replacement practices continues, but the pace has slowed. Producers are installing underground pipelines, gated pipe, concrete lined ditches, land leveling, and a variety of other practices. Nearly all the orchards and vineyards in the Palisades and Orchard Mesa area are being irrigated with high-efficiency drip or micro-sprinkler irrigation. Field trials of buried drip irrigation for high value crops such as onions have shown promise.

The installation of surge irrigation systems is promoted by NRCS staff and other consultants. The surge units provide the participants with the capability of performing fertigation, which allows applying liquid nitrogen fertilizer during the soak stage of irrigation. Well-managed surge systems can approach or equal the application efficiency of some sprinkler systems.
The valley is experiencing rapid urbanization. Some estimates place the remaining number of un-improved cropland at less than 10,000 acres.

Lower Gunnison Basin, Colorado

This project encompasses the irrigated farmland in the Gunnison and Uncompahgre River valleys and is located in Delta and Montrose counties. Implementation was initiated in 1988 in this unit. Nearly 50 percent of the salt control goal has been achieved.

The application of salinity reduction and wildlife habitat replacement practices continue to be an integral part of the implementation of Lower Gunnison unit. The major practices are underground pipelines, ditch lining, land leveling, irrigation water control structures, gated pipe, sprinkler, and surge irrigation system. Field-scale drip irrigation trials are proving successful. Premium prices for the aggressively-marketed Olathe sweet corn are encouraging more intensive water management efforts. NRCS and the Basin States piloted the installation of one of the first center pivot irrigation systems in the project in 2004. The success of the pilot, among other factors, has resulted in acceptance and adoption of sprinkler irrigation systems in the project area. A significant portion of new contracts in 2008 and 2009 were sprinkler systems.

Mancos River, Colorado

This project, near the town of Mancos, Colorado, was initiated and approved for funding and implementation by USDA-NRCS in April 2004. The first EQIP contracts were signed in 2005 and implementation of improved irrigation systems is proceeding on schedule. Currently, about 45 contracts have been developed with EQIP and Basin States Parallel funds. One large wildlife habitat replacement project has been installed. It is anticipated that approximately 5400 acres of improved irrigation systems with salt control benefits will be installed over the project life.

McElmo Creek, Colorado

Implementation was initiated in this unit in 1990. Application of salinity reduction and wildlife habitat replacement practices continue to be implemented in this area with sprinkler systems, underground pipelines, and gated pipe being installed.

Development and use of automatic shutoff valves for sprinkler systems continue to be widely implemented in the project to achieve water management. This project planned to install predominantly sprinkler systems with a small number of improved irrigation systems. The goal for treated acres has

been achieved. The salt reduction, however, has reached about 50 percent of the goal. This is likely due to a lower percentage of sprinkler irrigation being installed. This area is also experiencing the conversion of agricultural lands to residential properties.

Uinta Basin, Utah

Implementation began in this unit in 1980. More than 60 contracts were developed in 2009. A significant number of systems have reached or are nearing the end of their useful life. While these systems are a lower priority than first-time improvements, NRCS has begun providing incentives for replacement or up-grading. Sprinkler irrigation systems remain, by far, the preferred type of system. Producer participation is exceeding the original projections. Recently awarded off-farm delivery system grants by the Bureau of Reclamation should enable additional on-farm gravity sprinkler systems.

Price-San Rafael, Utah

Reclamation and USDA continued implementation of salinity control practices in the project area in fiscal year 2009. More than 40 new contracts were developed in the Unit in 2009, predominantly in the Huntington-Cleveland Irrigation Company service area. Currently, about $6M of active EQIP contracts are being implemented in the Huntington-Cleveland area. Participation is exceeding expectations; approaching 100 percent on many laterals. The Price-San Rafael project area has achieved about 40% of its salt control goal.

Muddy Creek, Utah

NRCS continues to receive applications for on-farm salinity control projects in this area. No funds have yet been obligated due to higher priority applications in the older salinity control areas, as well as the need to construct a large settling basin/control structure. The local irrigation district is actively pursuing options to locate funding to construct the needed silt-settling structure and it appears likely that the U.S. Army Corps of Engineers will provide assistance. This structure would be the first critical step to improving the delivery infrastructure that would enable on-farm salinity control measures.

Alkali Creek Tributary to Montezuma Creek, Utah

A project to investigate and demonstrate salinity control on grazing land is being implemented in southeastern Utah on Navajo Nation tribal lands. A partnership of NRCS from Utah and Arizona, Bureau of Land Management, Bureau of Indian Affairs and the Navajo Nation is contributing experimental design, data collection, and analysis and implementation of grazing land treatment practices in an effort to identify cost effective treatment in arid, grazed landscapes. The Basin States provided a grant of $92,000 to implement this project during 2006 and 2007.

Big Sandy River, Wyoming

Implementation has been underway in this unit since 1988. The application of salinity reduction and wildlife habitat replacement practices continues to be implemented. In this area, farmers are converting from surface flood irrigation to low-pressure center pivot irrigation systems for salinity control. Approximately 13,500 acres of the planned 15,700 acres have been treated (86 percent). Producers also report that the water savings from improvements in irrigation systems now allows a full irrigation season of water for the entire irrigation district. In 2009, NRCS provided technical and financial assistance to all interested producers to up-grade sprinkler nozzle packages. These latest nozzles, along with more intensive soil-moisture monitoring, provide additional irrigation efficiencies and salt savings.

Table 2 USDA Salinity Control Unit Summary
Thru 2009

Unit	[1]Controls (tons)	Potential (tons)	Percent of Goal	Costs	[1]Annualized Costs	Projected Total Cost	[2]Cost/ton
Mancos River	3,359	11,940	28%	$5,532,809	$458,670	$19,667,085	$137
Silt, CO	2,441	3,990	61%	$2,435,057	$201,866	$3,980,286	$83
Muddy Creek, UT	0	11,677	0%	$0	$0	[3]$11,655,523	$75
McElmo Creek	24,964	46,000	54%	$17,654,865	$1,463,588	$32,531,797	$59
Uintah Basin	140,407	140,500	100%	$92,793,583	$7,692,588	$92,855,046	$55
Manila-Washam, UT	5,731	17,430	33%	$3,797,827	$314,840	$11,550,536	$55
L. Gunnison	98,179	186,000	53%	$61,311,977	$5,082,763	$116,155,468	$52
Grand Valley	94,889	132,000	72%	$49,554,757	$4,108,089	$68,935,577	$43
Price/San Rafael, UT	58,354	146,900	40%	$24,010,260	$1,990,451	$60,443,281	$34
Big Sandy, UT	56,138	83,700	67%	$13,383,169	$1,109,465	$19,953,886	$20
TOTALS	484,462	780,137	62%	$270,474,304	$22,422,320	$426,072,962	$46

[1]Includes Off-farm funded with EQIP or Basin States Parallel funds
[2]Cost per ton based on amortization over 25 years at 6.625% interest.
[3]Estimate based on project plan.

Concluding Comments

Over half of the basinwide salt control goal has been obtained. Many of the earliest systems are nearing the end of their planned and useful life. Some systems are beginning to be replaced with new, higher-efficiency systems but the cost per ton may be two or three times the cost per ton of an initial system improvement.

Urbanization and conversion of agricultural land is significant in some project areas, particularly in Colorado. The nationwide economic recession has created a plateau of costs in most areas but has also made some producers to sign long-term contracts.

There is a continued need to understand the processes of reducing salt transport from grazing lands and to identify cost-effective salt-control measures.

Environmental Protection Agency (EPA)
Colorado River Basin Salinity Control Program
Fiscal Year 2009

During Fiscal Year 2009, EPA continued to provide coordination and assistance to the Colorado River Basin Salinity Control Forum and Advisory Council involving salinity control activities:

EPA provided several informational updates to the Forum and Advisory Council including updated State and Tribal Water Quality Standards and related program information for the October 2008 Forum meeting in San Diego, CA.

EPA Region 9 assumed the lead for EPA Regions 6 and 8 for coordination with the Forum and Advisory Council and continues to be available for responding to questions, requests, and other needs. Region 8 will continue in a lead coordination role for salinity control efforts located within Region 8.

EPA provided testimony before a Congressional field hearing in Tucson concerning lower Colorado River water quality issues. EPA as well as Department of Interior responded to Congressional inquiries more recently. These inquiries notably avoided salinity aspects of the lower Colorado River water quality issues as well as the potential impact of proposed solutions on salinity control.

EPA had somewhat reduced participation in Forum meetings during Fiscal Year 2009 due to retirement of key staff involved in earlier coordination efforts for the Salinity Control Program.

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Fish and Wildlife Service
Colorado River Basin Salinity Control Program
Fiscal Year 2009

U.S. Fish and Wildlife Service (Service) Salinity Coordinator has been an active participant working with the Wildlife Team, Reclamation Offices in Provo and Grand Junction in developing a Wildlife Management Plan that will be used to guide replacement of wildlife values forgone from Reclamation funded salinity projects. This plan will provide guidance to make habitat replacement equitable throughout the salinity project areas by developing comparable methods to evaluate habitat values forgone from salinity improvement projects within all the salinity areas.

The Service Salinity Coordinator was invited by the Bureau and NRCS to tour salinity project areas within Duchesne, Uintah, Carbon, and Emery counties in Utah. This tour was very informative as we looked at numerous Reclamation and NRCS salinity projects that have been completed or are under construction within these salinity project areas. The coordinator has also attended all Salinity Work Group meetings during the past year and has participated in their associated tours. This interaction with the Work Group members has been very informative and the tours have provided much insight in the salinity control areas and workings of the Group.

During the past year the Service Salinity Coordinator has worked with Reclamation and NRCS in Utah and Colorado evaluating habitat values forgone and reviewing habitat replacement plans as requested. The Service Salinity Coordinator is very involved in the ongoing effort to complete the Aspinall EIS and associated programmatic biological opinion which will address not only the flow within the Gunnison Basin but also water quality, selenium, which is elevated in the basin primarily due to agriculture. Salinity control projects constructed in the Gunnison Basin (principally in the Uncompahgre Project Area) will not only reduce salinity but will also reduce selenium helping to meet State Water Quality Standards and the requirements of the biological opinion.

The Service looks forward to continued participation in the Salinity Control Program. We will continue to work with Reclamation to refine our role in the Salinity Control Program. We are always available to provide technical assistance for wildlife habitat replacement planning and implementation. We are also available to assist agencies in revising wildlife habitat impact and replacement accounting methodologies.

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U.S. Geological Survey
Colorado River Basin Salinity Control Program
Accomplishments for Fiscal Year 2009

The U.S. Geological Survey (USGS) conducts a variety of data collection activities, and investigations and research to aid in the assessment of salinity conditions in the Colorado River, guide program management decisions, and to determine the effect of salinity control efforts. These activities are conducted in cooperation with the Colorado River Basin Salinity Control Forum (CRBSCF) and in support of Federal resource management agencies including the Bureau of Land Management (BLM), Bureau of Reclamation (Reclamation), and the Natural Resources Conservation Service (NRCS). In addition, activities and accomplishments in USGS National programs such as the National Streamflow Information Program (NSIP) and the National Water Quality Assessment Program (NAWQA) provide valuable information to Salinity Control Program (SCP) agencies. These SCP science-support activities and relevant USGS National program activities (described below) range from data collection in a basin-wide monitoring network, to research on the fate and transport of salt at various scales.

Efficient use of USGS resources in coordination with SCP participating agencies has been aided by a science planning process initiated in 2006. The process, implemented by the SCP Science Team made up of representatives from SCP participating Federal agencies, was developed to facilitate the efficient combination of science and data collection activities and study results toward an improved understanding of current and future salinity conditions and remediation opportunities in the Basin.

Twenty-Station Colorado River Basin Monitoring Network and Basic-Data Collection

The USGS monitors 20 key stream sites (stations) in the Colorado River Basin extending from near the headwaters to the Mexican border. Salinity data at the 20 stations are used to assess compliance salinity-level criteria and also track trends in long-term data sets as related to salinity control work. The USGS funds approximately 40 percent of the operation and maintenance of the 20-station monitoring network mainly through the USGS Cooperative Water Program and through NSIP.

Specifically, the program of water-quality monitoring consists of three levels: (1) Monitoring for evaluation of individual salinity control measures, (2) stateline monitoring, and (3) monitoring for determination of annual average flow-weighted concentration in the lower main stem. The Reclamation-developed planning model known as the Colorado River Simulation System or CRSS planning model incorporates data from the monitoring network to simulate both flow and salinity throughout the Colorado River Basin. Each year the USGS computes continuous monthly total dissolved solids (TDS) concentrations data from data gathered at the 20 salinity-monitoring stations. The reliability of the estimates and thus their utility for use in the CRSS model is increased with sufficient periodic water-quality analyses for TDS and the collection of daily values of specific conductance. To ensure an understanding of the data quality, Reclamation generates a brief report that categorizes the 20 sites according to collection frequency and quality. In 2008, the USGS initiated improvements in data-collection approaches to elevate the monitoring status of six sites from "Class B" (defined as salt-load computations possible, however, data availability could be contributing to error in salt-load estimate) to Class A (defined as adequate data available for salt-load computation where daily flow and specific conductance are monitored). In 2009, these improvements were completely implemented in part through optimizing the use of personnel conducting the data-collection activities in the network and by utilizing new instrumentation approaches to enhance efficiency of data collection.

The USGS and Reclamation have worked together beginning in 2007 to check quality assurance of laboratory results for TDS from the Reclamation laboratory in Boulder City, Nevada, and the USGS National Water Quality Laboratory. The need for this effort stemmed from an observed difference

between Reclamation and USGS estimates of TDS below Hoover Dam, where Reclamation values are typically about 30 mg/L higher than USGS values. Paired sampling at the USGS streamflow gage below Hoover Dam and the Reclamation sampling site at the Hoover Dam tailrace took place in 2008. Reclamation is currently summarizing the information and will report and provide recommendations regarding whether to continue (1) The independent grab samples from both Reclamation and the USGS or to just continue with one, (2) computing TDS from daily specific-conductance values and grab samples taken by Reclamation and using their modeling approaches, or (3) to use USGS grab samples and the USGS SLOAD (the method used for salinity data development in CRSS) program.

Documenting the Effects of Grazing on Sediment, Water, and Salinity Production from Mancos Shale soils – Badger Wash, Colorado

This project is addressing the impacts of grazing on the amount of sediment, salinity, and selenium released from upland soils. Eight paired watersheds were identified within the Badger Wash basin and one watershed of each pair was fenced to prevent access by domestic livestock. This created four watershed pairs. Two of these pairs have an eastern aspect, rolling to steep topography, low levels of channel incision, and have both sandstone and Mancos-derived soils. The other two pairs have a western aspect, steep slopes, highly incised channels, and only Mancos-derived soils.

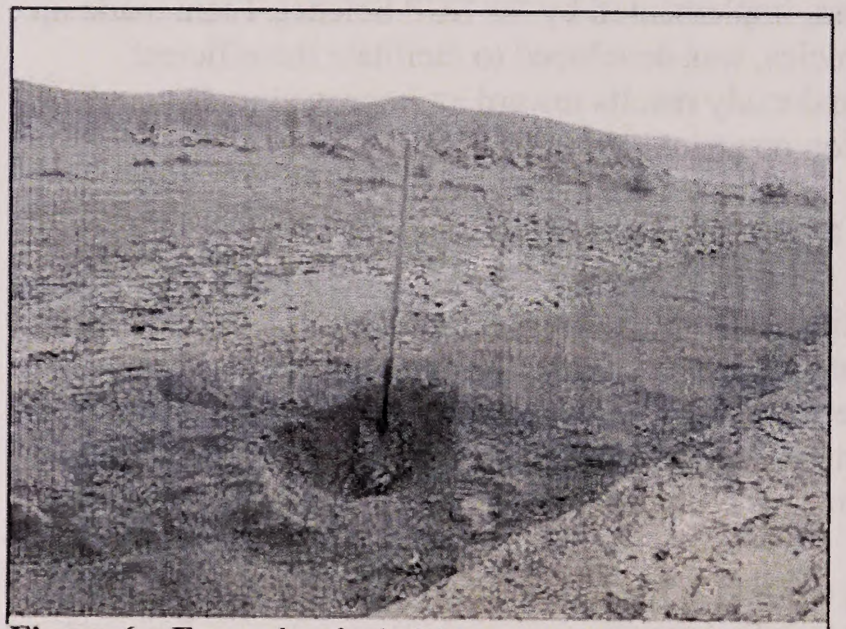


Figure 6 – Example of wind-blown sediment filling washes

Activities in 2009 have included installations and experiments assessing both water and wind erosion:

Silt Fences: Installation of 20 silt fences at the base of slopes, with 10 fences in grazed and 10 fences in the ungrazed watersheds on different soil types. These fences collect water-borne sediments and were emptied five times during the year. Although the numbers are preliminary, it appears that silt fences in the grazed watersheds have collected significantly more sediment than fences in the ungrazed watershed.

Runoff collectors: In 2009, three storm events tripped installed water collectors. However, this runoff only occurred in the grazed watershed. The same storms did not trip the collectors in the adjacent ungrazed watershed. Water samples will be sent in for analysis.

Ponds: Unfortunately, there have not been any storm events large enough to fill study area ponds, and thus no measure of total runoff has been determined.

Wind tunnel experiments: Wind tunnel experiments have been conducted on seven of the planned ten sites (five soil types). So far, disturbed soils have produced 4.5 times more sediment than undisturbed soils. The rest of the sites will be finished in the next few weeks.

Wind-blown sediment collectors: Installation of eight dust collectors, four in a grazed watershed and four in the adjacent, ungrazed watershed. Sediment collected was highly variable among the sites. However, preliminary data indicate that dust production is higher in the grazed watershed as compared to the ungrazed watershed. This is important, as a major portion of the wind-blown material is deposited in washes. This material is then washed out when major rain events occur.

Mancos Shale Landscapes: Science and Management of Black Shale Terranes (a Regional Partnership Project) - FY 2009 research efforts in the Factory Butte area of central Utah

The Factory Butte area of central Utah is being used as a natural laboratory to study the source and transport of chemical components associated with salinity, selenium, and sediment loading in the Fremont River, a tributary of the upper Colorado River. The current focus of studies is on quantification of erosion processes, soil chemistry, runoff chemistry, and the chemistry of the Fremont River. A principal objective of the study is to establish chemical links between the materials being eroded and those affecting the Fremont River water quality, as well as the quantification of hillslope erosion, which is supplying sediment and solutes to the river.

Monitoring of the Fremont River has been initiated at three locations. The first gage was set in March of 2009 and the last one was put in place in September of 2009. A real-time gaging station has been established above Caineville (http://waterdata.usgs.gov/nwis/uv?09330230) and temporary gages have been placed below Caineville and close to the old Giles town site. The river reach between the gages above and below Giles is influenced by runoff and possibly groundwater recharge from pre-Cretaceous rocks and agricultural lands. The next downstream reach is affected by runoff from Mancos Shale areas that range from relatively undisturbed to heavily used off-highway vehicle play areas. In addition to data collected by the gages (temperature, specific conductance, and, at the real-time site, discharge), water samples will be collected for chemical analyses nine times per year at each of the three sites. Discharge will be measured at the same time the water samples are collected.

In order to sample the solutes moving into the Fremont River during rain events, passive water samplers have been placed on three arroyos draining the North Caineville Mesa area (including the Swing Arm City play area), on Neilson Wash which drains a large area (including a large portion of Factory Butte), and on Sweetwater Gulch which drains a very large undisturbed area south of the Fremont River. Each site has two samplers set at different elevations above the arroyo bed to catch flow at different stages of the storm event. Samples will be chemically analyzed. A significant storm event in April 2009 was sampled.

Approximately 180 soil samples were collected from the drainages feeding the 3 arroyos draining the North Caineville Mesa area. These will be used to characterize the chemistry of the material interacting with rainfall during storm events.

Hillslope erosion is being measured by acquiring repeated high-resolution, ground-based LiDAR, surveys for both disturbed and undisturbed slopes within the three drainages where the soil samples were collected. A total of five slopes have been measured at least twice. The digital surveys are used to construct 3-D models of the slopes. Pairs of models developed for different times can then be compared to each other and the quantity of erosion or accumulation of sediment can be determined. Sediment accumulation and erosion on the alluvial plain/pediment surface between North Caineville Mesa and the Fremont River is being evaluated by making repeated measurements of differences in elevation between fixed points on the surface and fixed points on relatively stable fence posts.

Characterization of Hydrology and Salinity in the McElmo Creek Region, Prior to and During Selected Stages of the Construction and Implementation of Irrigation Delivery and Salinity Control Work by the Dolores Project

In the Colorado River basin, the quantification of improvements in water-use efficiency associated with salinity-control projects, the verification of salinity reductions claimed versus actual amounts of salinity reduced, and the determination of natural and human-induced sources of salinity are needed. This information is used for planning of salinity-control projects. It also provides updated calibration and

verification data sets for predicting salinity loading in the Colorado River Basin and understanding the effects of land-use change. To develop this information, long-term data sets derived from detailed sampling networks are needed. These data sets exist for the Colorado River Basin, but they often lack the temporal or spatial coverage needed for a detailed analysis. However, for the McElmo Creek region of the Dolores Project, a very comprehensive data set is available. This study will mine the data set for the McElmo Creek region in order to provide information to address critical salinity issues.

The primary objective of the work is to characterize the hydrology and salinity concentrations and loads in the McElmo Creek region. The data set will be used to evaluate changes in salinity over time (starting in the early 1970s) using trend analysis techniques. Additional objectives will address human-induced salinity loading and provide updated calibration data for Reclamation's CRSS model.

The study report was completed in 2009 and is currently in technical review and will be published in 2010. Preliminary results indicate significant downward trends in salinity load at outflow and inflow sites in the McElmo Creek basin. The total decrease in salinity load at outflow sites was larger than that observed at inflow sites. Data from McElmo Creek at the USGS streamflow gaging station near the Colorado State Line indicated downward trends on the order of 36,000 tons per year. This decrease exceeds the estimated decreases reported in the Reclamation's 1988 Dolores Project Supplemental Plan Report and NRCS on-farm projections combined.

Additional analysis was done to evaluate agricultural vs. non-agricultural salinity loads. Results indicate approximately 36 percent of the salinity load in McElmo Creek is from non-agricultural sources. Digital data transferred from hardcopy for Reclamation is stored at the following public domain web address: http://rmgsc.cr.usgs.gov/cwqdr/Southwest/.

Statistical Modeling Applied to Assessing the Distribution of Salinity Load, Load Sources, and the Effects of Land-Use and Water-Use Changes on Loading Rates in Streams of the Colorado River Basin

The USGS has been working on a set of studies that involve the development of models that assess the distribution of salinity loads in surface waters and sources of those loads in the Basin and its sub-regions including ungaged reaches. The resulting statistical models represent the surface-water flow system at a range of scales and are based on conceptual models that relate observed loads in basin streams to up-basin physical characteristics including elevation, precipitation, geology, land cover, and land and water use. Each model has scale-related utility and limitations and together provides a tool set that can be used to improve SCP managers' and planners' understanding of the salinity-load balance in the Basin and to prioritize and optimize SCP resources toward efficient and cost-effective control projects.

A USGS NAWQA effort developed a Spatially Referenced Regressions On Watershed attributes (SPARROW) model to estimate source loadings, transport losses and basin exports. Results from the SPARROW model can be used to identify which natural and human sources are most significant in sub-basins of the study area. The study was completed in 2007 and documented in the USGS report entitled "*Dissolved Solids in Basin-Fill Aquifers and Streams in the Southwestern United States*" (Scientific Investigations Report 2006-5315) available on the Internet at http://water.usgs.gov/nawqa/studies/mrb/salinity.html.

The USGS has worked with SCP participating Federal agencies including Reclamation and has developed studies that will utilize the methodologies of the Southwestern Regional NAWQA study at the scale of the upper Colorado River Basin (UCRB) to aid in determining the annual loads of dissolved solids contributed from natural and human sources within selected UCRB sub-basins where discharge and water-quality data are sparse. The following two modeling efforts are ongoing:

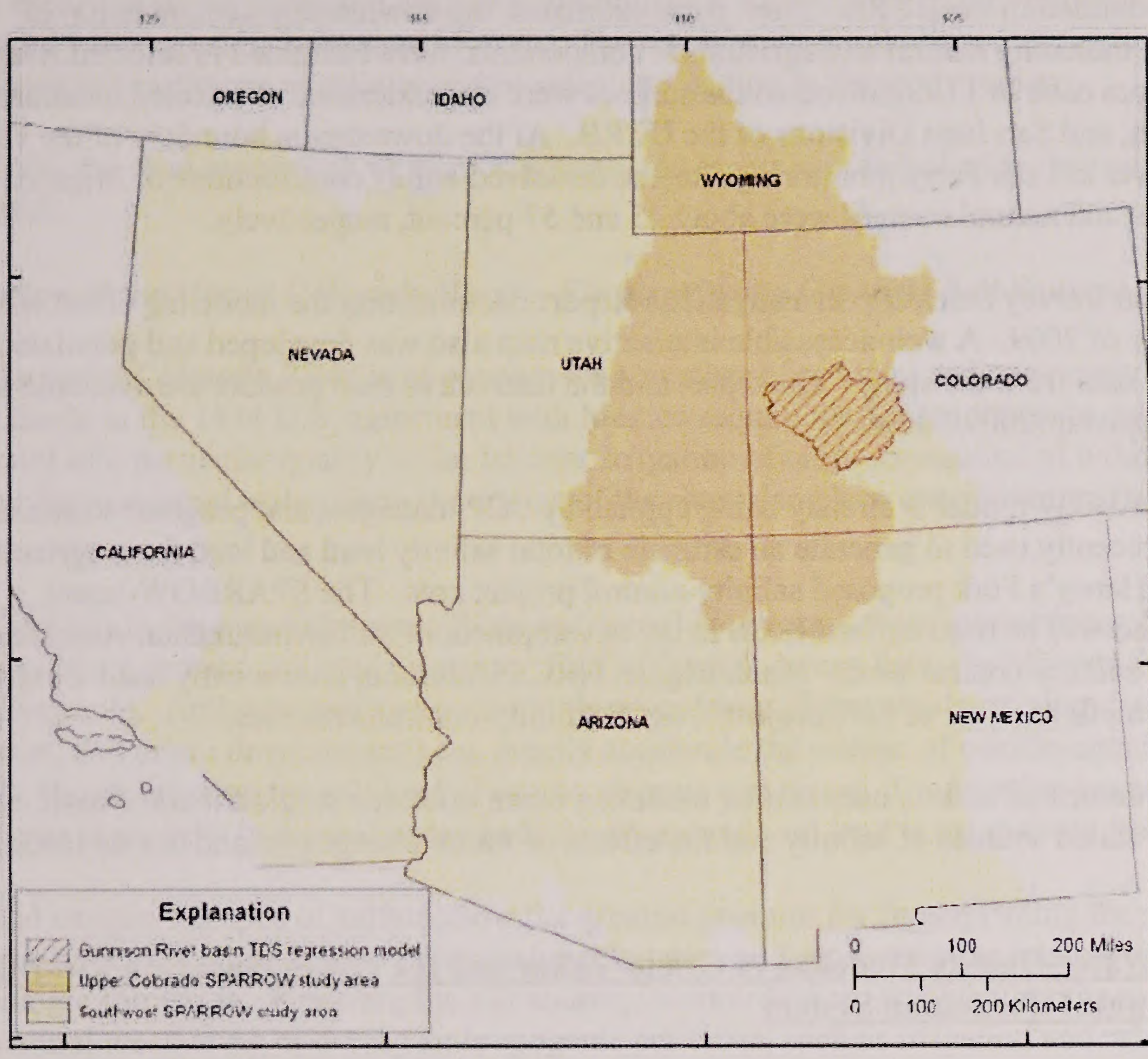


Figure 7 – Areas of study for three USGS statistical modeling efforts to assess the spatial distribution of salinity loads and load sources.

<u>Watershed-scale assessment of salinity loads in the Upper Colorado River Basin–Estimating the dissolved-solids load in Upper Colorado River Basin streams and the spatial distribution of select dissolved-solids sources using the U.S. Geological Survey SPARROW model</u>

The economic effects of increased salinity in the Colorado River have prompted a number of water-quality related legislative actions. Salinity in streams of the UCRB, as measured by TDS concentration and load, is variable. Optimal management and (or) mitigation of salinity requires an improved understanding of the spatial distribution of salinity sources, load accumulation, and transport mechanisms. The USGS SPARROW model relates measured transport at monitoring stations to upland catchment attributes including contributing upstream reaches. Applying this SPARROW modeling framework specifically to the UCRB for TDS will enhance the spatial understanding of dissolved-solids sources and transport throughout the Basin.

The principal goal of the project was to calibrate a SPARROW model to better understand and estimate the sources, transport, and accumulation of dissolved-solids loads throughout the UCRB. The project has developed statistically-based estimates of dissolved-solids loading sources and transport for reaches at the subwatershed level throughout the UCRB. The estimates and associated uncertainties obtained from the calibrated dissolved solids SPARROW model provide guidance for future salinity-related data collection and assessment. Up-to-date load statistics for more than 180 monitored locations in the UCRB have been computed.

Predictions of dissolved-solids loads were generated for more than 10,000 stream reaches of the

stream network defined in the UCRB. From these estimates, the downstream accumulation of dissolved solids, including natural and agricultural components, were examined in selected rivers. Contributions from each of 11 dissolved-solids sources were also examined at selected locations in the Grand, Green, and San Juan Divisions of the UCRB. At the downstream boundary of the UCRB, the Colorado River at Lees Ferry monitoring site, the dissolved-solids contributions of irrigated agricultural lands and natural sources were about 45 and 57 percent, respectively.

A U.S. Geological Survey Scientific Investigations Report documenting the modeling effort was published in May of 2009. A web-accessible interactive map also was developed and populated with input and output data from the study. The report and the interactive map product are available at http://pubs.usgs.gov/sir/2009/5007/.

The UCRB SPARROW model is already being applied by SCP managers and program scientists. The model was recently used to generate an estimate of total salinity load and load from agricultural water use in the Henry's Fork proposed salinity-control project area. The SPARROW-based assessment of load will be used by the NRCS in the development of an Environmental Assessment for the proposed salinity control work. Frank Riggle, NRCS Colorado, has recently used the model to conduct a cost benefit analysis of "off-project" NRCS salinity-control activities.

A second study, described below, uses similar modeling techniques at a single tributary-basin scale to assess land-use-related sources of salinity and the effects of future changes in land use on loading rates.

Targeting and Water-Quality Modeling in Grand Valley and the Lower Gunnison River Basin Using a Geographic Information System

Salinity and selenium water-quality issues in the UCRB of western Colorado have been the focus of remediation efforts for many years. In response to the Salinity Control Act of 1974, Reclamation and the NRCS have focused on salinity control through the CRBSCP and Environmental Quality Incentives Program (EQIP). The primary methods of salinity reduction are lining and piping of irrigation canals and laterals and assisting farmers to establish more efficient irrigation practices on agricultural land. Starting in 1988, the National Irrigation Water Quality Program (NIWQP) began investigations to determine other possible adverse effects of irrigation drainage on water quality in the Western United States. The NIWQP investigations indicated that irrigation drainage contributes a significant part of the selenium load to the UCRB. These previous investigations determined that a relation exists between subbasin characteristics (Mancos Shale outcrops, agricultural practices, and irrigation water-delivery system design) and salt and selenium loads at the mouths of certain subbasins. In a subsequent investigation, the USGS used this information to develop decision trees and maps to perform a cursory evaluation of the likelihood that an area has (or may have) water-quality problems. The qualitative method developed by the USGS, while effective for large-scale assessments, was less effective at providing specific details essential to the planning and evaluation phases of the remediation process. In FY 2004, development began on a water-quality model (also referred to as a regression model) for the Lower Gunnison River Basin using a GIS. Development of this tool, referred to as the Upper Colorado Detailed Salinity Model (UCDSM), intended to provide a quantitative method for evaluating the effects of remediation in the Lower Gunnison River Basin and Grand Valley.

Basin characteristics potentially related to the production and mobilization of salinity and selenium were quantified by subbasin boundaries using a GIS. In order to determine the most statistically significant combinations of independent variables, a statistical evaluation of the variables is performed using interactive-stepwise regression. This regression technique uses manual inclusion

and exclusion of variables and evaluates the statistical significance of the resulting P-values, R-squared values, residual plots, and F-tests. The result is a multiple-linear regression equation that explains the variations in salinity and/or selenium loading in the study region.

In 2009, the final report was written. Currently the report is in technical review and will be published in 2010.

Salinization of the Upper Colorado River—Fingerprinting Geologic Salt Sources

Salt in the upper Colorado River is of concern for a number of political and socioeconomic reasons. Salinity limits in the 1974 U.S. agreement with Mexico require the United States to deliver Colorado River water of a particular quality to the border. Irrigation of crops, protection of wildlife habitat, and treatment for municipal water along the course of the river also place restrictions on the river's salt content.

Most of the salt in the upper Colorado River at Cisco, Utah, comes from interactions of water with rock formations, their derived soil, and alluvium. Half of the salt comes from the Mancos Shale and the Eagle Valley Evaporite. Anthropogenic activities in the river basin (for example, mining, farming, petroleum exploration, and urban development) can greatly accelerate the release of constituents from these geologic materials, thus increasing the salt load of nearby streams and rivers. Evaporative concentration further concentrates these salts in several watersheds where agricultural land is extensively irrigated.

Sulfur and oxygen isotopes of sulfate show the greatest promise for fingerprinting the geologic sources of salts to the upper Colorado River and its major tributaries and estimating the relative contribution from each geologic formation. Knowing the salt source, its contribution, and whether the salt is released during natural weathering or during anthropogenic activities, such as irrigation and urban development, will facilitate efforts to lower the salt content of the upper Colorado River.

The scientific objective of this study was two-fold: (1) Develop diagnostic geochemical tracers for the major geologic sources of salt to the upper Colorado River and (2) demonstrate the use of these tracers to understanding contributions of nonpoint geologic sources of salt to the upper Colorado River. The study is complete and a USGS Scientific Investigations report has been published (http://pubs.usgs.gov/sir/2009/5072/) describing the demonstration of the approach and estimating the geologic sources of load during high-flow runoff, in irrigation return flow, and in baseflow in streams in the study area above Cisco.

Ranking Subbasin Salinity Loads in the Lower Gunnison Basin

In 2008, the USGS began a study to define a ranking of subbasins (by tons of salinity load from a given subbasin) in the Lower Gunnison Basin which will allow for objective, informed targeting of subbasins for salinity control projects and will provide information to estimate the cost per ton of salinity removed from the system by off-farm salinity-control projects.

The assessment will enhance and then utilize the recently developed Upper Colorado Detailed Salinity Model (UCDSM) as a principal assessment tool for the Gunnison Basin.

Work will be conducted in two phases:

Phase I

Update and enhance the existing UCDSM model for use as a ranking tool

Incorporate improved GIS information for canal and lateral locations (GIS coverages to be updated by Reclamation and not included in the funding request)
Incorporate improved irrigation method codes contained in the 2000 irrigated land coverage (irrigation codes to be updated by Reclamation and not included in the funding request)
Review and revise model algorithms to improve utility and accuracy at different scales
Update model with results of recent field work and studies

Rank subbasins

Phase II - Augment monitoring in high-ranked basins - The results of the ranking exercise will be used to locate high priority areas (cost effective areas for salinity control as determined by Reclamation). This ranking process is especially useful for the data-poor areas that otherwise would have limited justifications for priority salinity control efforts. Water-quality sampling for salinity and streamflow will be done in areas that were data poor and ranked as a high priority for salinity-control projects.

In 2009, a Memorandum of Understanding regarding USGS use of the NRCS/Colorado River Districts Conservation Innovation Grant (CIG) data was successfully drafted. The USGS anticipates sign off by the NRCS by September 2009. At such time, work will begin on incorporating information from the CIG into the geospatial information needed to upgrade the irrigated lands/irrigation applied layer for model processing. Also upgraded was the soils information for the Lower Gunnison and Grand Valley study areas for use in upgrading the model accuracy. Extensive work was also directed toward improving the water-quality data set used for model calibration. Work was needed to adjust salinity loads at multiple sites due to wet and dry periods and also salinity contamination from the irrigation system. The majority of the obvious problems were addressed in FY 2009; however, more adjustments may be needed during model calibration if aberrant outliers are observed in statistical diagnostics.

Assessing the Effects of Salinity Control Projects in the Lower Gunnison Basin

In 2008, the USGS began a study to quantify the effects of salinity control projects on salinity levels in the Gunnison River at various locations in the Lower Gunnison Basin. Specifically, the study will allow for the estimation of the percent of total observed salinity decrease that is related to on-farm (field irrigation) activities and off-farm (delivery of irrigation water) amounts as well as understanding what portion of the decreasing trend may be from the Upper Gunnison Basin, population growth, and non-agricultural sources.

Study tasks include:

Assess trends for the Upper Gunnison Basin at the Gunnison River below Gunnison Tunnel streamflow gaging station to determine the portion of the decreasing trend for the Lower Gunnison Basin at the White Water gage that can be attributed to the Upper Gunnison Basin decreases.
Assess trends in the Lower Gunnison Basin at selected sites to better identify which regions may have the highest rates of decreasing trends and help to bracket agricultural areas and salinity control projects in the Lower Gunnison Basin.
Use results of trend analysis to identify regions of the Lower Gunnison Basin where the highest rates of decreasing trends in salinity load have occurred.
Compare trend analysis results to estimates of off-farm and on-farm salinity reduction resulting from salinity control projects in the Lower Gunnison Basin. (More discussion with Reclamation and the NRCS is needed to determine if cumulative estimates for off-farm and on-farm salinity reductions can be obtained for the proposed regions).
Assess total and annual salinity loading for 1986-2003.

Results of the study are providing the SCP with a better understanding of the portion of the salinity load that has been reduced by factors influencing salinity loads in the Lower Gunnison Basin and provide context for a thorough understanding of the amount and sources of salt that remain to be controlled in the Lower Gunnison Basin.

Preliminary trend analysis results indicate that downward trends in salinity at the Gunnison River near Grand Junction streamflow gage ('Whitewater Gage') result from changes occurring in the Lower Gunnison Basin. These downward trends also appear to occur within areas where the majority of salinity control has been focused in the Lower Gunnison Salinity Control Unit. Some significant upward trends in salinity loads were observed between the 'Whitewater Gage' and the Uncompahgre River at Delta streamflow gage. The cause of these upward trends is not known at this time and further investigation of the trend testing will be done to verify these findings.

Characterization of Salinity and Selenium Loading in the Smith Fork Region of the Lower Gunnison Basin

Reclamation and NRCS are responsible for assessing and implementing measures to reduce salinity loading in the Colorado River Basin. As part of this process, cost-sharing programs are used to involve the agricultural community in the salinity reduction efforts. These cost sharing programs help farmers, ranchers, and canal companies improve the efficiency of irrigation and water delivery systems. These delivery systems have been identified as potential sources of seepage which can cause salinity loading. Reclamation and NRCS wish to prioritize the systems that are the highest seepage sources in order to maximize the effectiveness of the various salinity-control programs. Several salinity-control units (Grand Valley and the Uncompahgre project region of the Lower Gunnison) have been extensively studied by Reclamation and NRCS; however, some areas of the Lower Gunnison Unit have limited data available with which Reclamation and NRCS can prioritize salinity-control efforts. In order to make reasonable estimates of salinity-load reductions that will result from salinity-control efforts in these data-limited areas, additional information is needed. The study focuses on data collection and analysis for one of the most data-poor regions; the Smith Fork region of the Lower Gunnison Salinity Control Unit.

The Smith Fork region is located near the city of Crawford in western Colorado. The study will assess seven streams in the Smith Fork region including the Smith Fork, Red Canyon Gulch, Alum Gulch, Cottonwood Creek, Bell Creek, Reynolds Creek, and one unnamed stream. These streams receive irrigation water from varying sources including Crawford Reservoir, the North Fork of the Gunnison River, inter-basin diversions, and to a limited extent groundwater.

The specific objectives of the work are to:

- Characterize total annual salinity loads from each stream system.
- Characterize groundwater in natural (unirrigated) and irrigated areas.
- Calculate salinity loading factors for each stream system.
- Characterize natural salinity loads from each stream system.
- Characterize on and off-farm salinity loads in each stream system.
- Calculate salinity/selenium ratios for each stream system.
- Report total annual salinity and selenium loads from the Smith Fork region.

Data collection was completed in 2009 for the study. Surface water salinity loads have been calculated for each sample location. A mass accounting of the surface water salinity load and an estimate of groundwater load using the GW model (HYSEO) is currently ongoing. A draft report for the study is scheduled for December 2009 with a final report in the spring of 2010.

Effects of Urbanization on Salinity and Selenium Loading in Montrose Arroyo, Western Colorado

Since 1993, an estimated 75 percent of agricultural land has transitioned to urban land in the lower portion of the Montrose Arroyo subbasin, with most of the transition occurring after 2000. A previous study documented, on a site-specific basis, a decrease in water use and deep percolation associated with the conversion of agricultural lands to urban land use. The project revisits Montrose Arroyo to determine, on a watershed level, the effects of urbanization on salinity loading. The Montrose Arroyo study assesses the integrated effects of multiple types of land use change including the conversion of previously unirrigated land to residential use. The information gained from this study will be used to help understand what the future effects of residential growth will be on salinity levels in the Uncompahgre Valley.

Specific activities include:

- Collect semi-monthly (six samples per year) water-quality data through two irrigation water years (April 2008 through March 2010) at the three sites on Montrose Arroyo sampled by Butler (2001).
- Quantify areas of urban development that have occurred since 2000 using GIS data and data from other sources.
- Estimate changes in salinity loading (trends upward or downward) using in-stream data and compare to historical instream data.
- If changes are observed, estimate future salinity loads for the east side of the Uncompahgre River Basin.
- Provide calibration information for the land-use change algorithm in UCDSM software.

Data collection for the project is ongoing. Sampling will end in March 2010. Data analysis will begin in March 2010 and a draft report is scheduled for September 2010.

Estimation of Land Disturbance Associated with Energy Development in the Upper Colorado River Basin and Assessment of Potential Effects on Salinity in Basin Streams

The UCRB in many areas is underlain by a thick sequence of Mesozoic marine and lacustrine rocks that are a significant source of salinity to water resources in the Basin. The past decade has seen an increased focus on oil and gas drilling activity in the West. The CRBSCF and the BLM are concerned that this development could increase salinity loads in the UCRB. Regional-scale compilation, synthesis, and analysis of data defining oil and gas development-related land disturbance and water quality in the UCRB is needed to improve understanding of the potential cumulative effects of oil and gas development on dissolved-solids loads to the Colorado River and its tributaries.

In the summer of 2007 the USGS began a study in collaboration with the BLM and Reclamation to consolidate local and regional data sets of land disturbance associated with oil and gas drilling activity in the UCRB into a single oil and gas-related land disturbance data set. The principal goal of the project was to estimate the total area of oil and gas-related land disturbance in the UCRB and to test the statistical significance of that land disturbance on contributing salinity to surface water in the UCRB.

The extent and location of current and past land disturbance from oil and gas drilling activity has been estimated and potential future oil and gas-related land disturbance has been projected to the year 2025. Current land-disturbance estimates were based on oil and gas well locations gathered from state databases during the summer of 2007. Well information in each state database was compiled and standardized to a single GIS dataset. Well status information provided in the state databases was used to determine if a

well might currently be associated with land-surface disturbance from drilling activity. These wells were classified as active. Active wells were assigned an area of disturbance based on information about well pad and resource road construction practices gathered from BLM Best Management Practices (BMP), Environmental Impact Statements (EIS), Environmental Assessments (EA), Resource Management Plans (RMP), and from systematic examination of drilling-related land disturbance in recent aerial imagery. Estimates of past oil and gas drilling disturbance were developed by rolling back 2007 estimates to 1991 based on date information from the state well databases.

The accuracy of current land-disturbance estimates was assessed by comparing the estimated area of land disturbance with the total area disturbed by oil and gas activity observed in aerial imagery within 76 100-square kilometer sample cells. The sample cells were randomly selected and were spatially distributed across the study area. Oil and gas-related land-disturbance estimates were compiled and input to the UCRB SPARROW model to test the statistical significance of estimated past and current oil and gas drilling-related land disturbance on dissolved-solids loads in surface water in the UCRB.

As of September 2, 2009, disturbance estimates and projections have been completed and assessed for accuracy. Input to the SPARROW model has been completed. The report has been written and submitted to peer review. Peer review comments are currently being addressed in preparation for the final technical edit and formatting for publication. It is believed that the report and related GIS data will be published by January 2010. Because the report has not received final review and approval for publication, the results discussed below are considered preliminary and only presented here as documentation of progress and plans for this project.

Well pad areas were estimated by creating a 2.26-acre polygon around each active well. The location of resource roads was estimated based on a synthetic road extending from each active well location to the intersection with an existing road contained in an ancillary GIS data set. The total area of land disturbance from resource roads was then estimated by assuming a uniform 35-foot width for the length of the synthetic road. Approximately 117,500 acres of land was estimated to be disturbed from oil and gas activity from about 36,400 active wells in 1991. About 78,800 acres of the total disturbed area were from well pads and 38,700 acres were from resource roads. About 179,400 acres of land were estimated to be disturbed from 61,780 active well locations in 2007; 120,400 acres of that area are from well pads and an additional 59,000 acres are from resource roads. Land disturbance from oil and gas drilling activity may reach up to 319,300 acres from active well pads and resource roads in 2025. This estimate is based on average levels of anticipated drilling activity reported in BLM reasonably foreseeable development forecasts.

Land disturbance estimates for 1991 were input to the dissolved-solids SPARROW model for the UCRB to test the statistical significance of oil and gas-related land disturbance on salinity load in the Basin. Land disturbance estimates for 2007 were input to an exploratory SPARROW model that was calibrated to available water quality for 2007. The source coefficient estimated for the oil and gas disturbance in both model frameworks was zero, indicating that the estimated disturbance is not statistically significant in explaining dissolved solids in UCRB streams. The lack of significance in the contaminant transport modeling framework may be due to the amount of available monitoring data, the spatial distribution of monitoring sites with respect to land-surface disturbance, or the overall quantity of land-surface disturbance associated with oil and gas development basin wide. Finally, dissolved-solids loads from natural landscapes may be similar to loads derived from lands disturbed by oil and gas resource extraction activity.

Investigation of Transport of Dissolved Solids Discharged from Pah Tempe (La Verkin) Springs, Southern Utah – Phase I, Reconnaissance

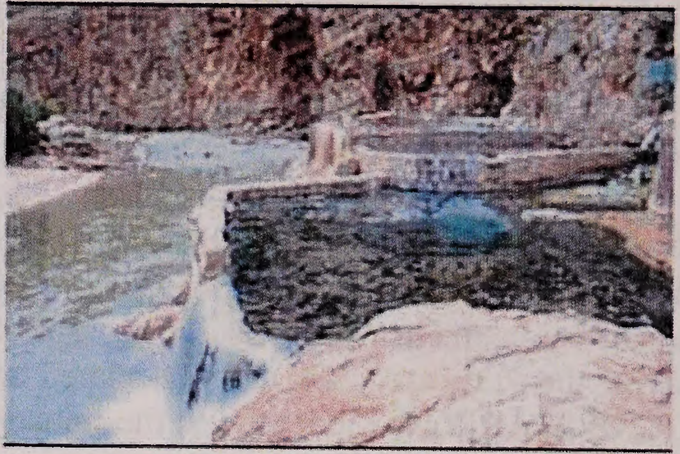


Figure 8 – Pah Tempe Springs, Washington County, Utah

Pah Tempe Springs discharge substantial amounts of dissolved solids (salt) to the Virgin River – about 101,000 tons per year. These dissolved solids are transported downstream and contribute to the salinity of the Colorado River. Consequently, they affect the suitability of water in the Lower Colorado River Basin for agricultural, industrial, and domestic uses. Studies conducted in the 1970's and 80's determined that desalinization of the water discharged from Pah Tempe Springs is technically feasible. However, the reduction in dissolved solids that would have been realized in the Colorado River from this type of project was less economical, at the time, than other proposed projects and involved several uncertainties. Consequently, the project was not implemented. During 2007-08, the USGS in collaboration with the SCP conducted an assessment to determine (1) Whether data collected, or studies completed, in the Virgin River Basin since 1984 conflict with or corroborate the underlying hydrologic and hydrogeologic assumptions and conditions associated with the determination of no action (desalinization) for the La Verkin Springs Unit by Reclamation in 1981 and 1984, and (2) whether hydrologic modifications within the Virgin River Basin since 1984 have affected the transport of dissolved solids from Pah Tempe Springs downstream to below Littlefield, Arizona.

The over-arching goal of the SCP is the cost-effective reduction of salinity in the Colorado River. An analysis of retrospective studies and data in a reconnaissance phase of this investigation was conducted during 2008 to provide managers with information needed to determine if they should proceed with a more rigorous and comprehensive assessment of the Pah Tempe Springs salinity load and the development and consideration of possible remediation scenarios.

This first phase of study included a review of existing interpretive studies and management plans and interpretation of more recent data. A conceptual hydrosalinity model for the Virgin River downstream of the USGS gage at Virgin, Utah, was defined, then the hydro-salinity analysis prepared by Reclamation for the La Verkin Springs Unit, its underlying data, assumptions, and conclusions were compared to the updated conceptual hydrosalinity model. A report of study findings was completed and delivered to Reclamation in February of 2009. A summary of the results of phase 1 was given to the SCP Work Group and Advisory Council. **Key findings of the reconnaissance phase of the investigation included:**

- Flow and dissolved-solids loads in the Virgin River Basin were substantially different during 1992-2006 than those reported for the period prior to 1971.
- Measurements of Pah Tempe Springs discharge and dissolved solids have varied considerably during the past 20 years.
- Additional flow in the Virgin River from St. George Regional Water-Reclamation Facility outflow and less seepage loss from the river downstream of St. George than was previously reported has affected dissolved-solids transport in the Virgin River.
- Removal of salts discharged from Pah Tempe Springs would result in a larger initial reduction in dissolved-solids loads in the river at Littlefield, Arizona than previously estimated.

Based on the results of the first phase of study, Program managers determined to move forward with a comprehensive investigation. The scope of work for this second phase was defined by recommendations resulting from phase 1 and include:

1) Determine the sources of groundwater discharged from Littlefield Springs and the approximate age of this spring discharge,
2) Determine the current discharge and dissolved-solids concentration in water from Pah Tempe Springs and identify seasonal variations in these parameters,
3) Acquire additional data for calibrating Virgin River dissolved-solids load models, particularly in the lower Virgin River Basin (that portion of the basin downstream of the Virgin River Gorge),
4) Determine if salt reduction in the Virgin River associated with the removal of salts discharged by Pah Tempe Springs will affect the dissolution of salts in soil and rock in downstream agricultural areas or in the aquifer upgradient of Littlefield Springs,
5) Determine the amount and variation of seepage occurring in the Virgin River reach between Bloomington, Utah, and the USGS streamflow gage above the Narrows in the Virgin River Gorge.

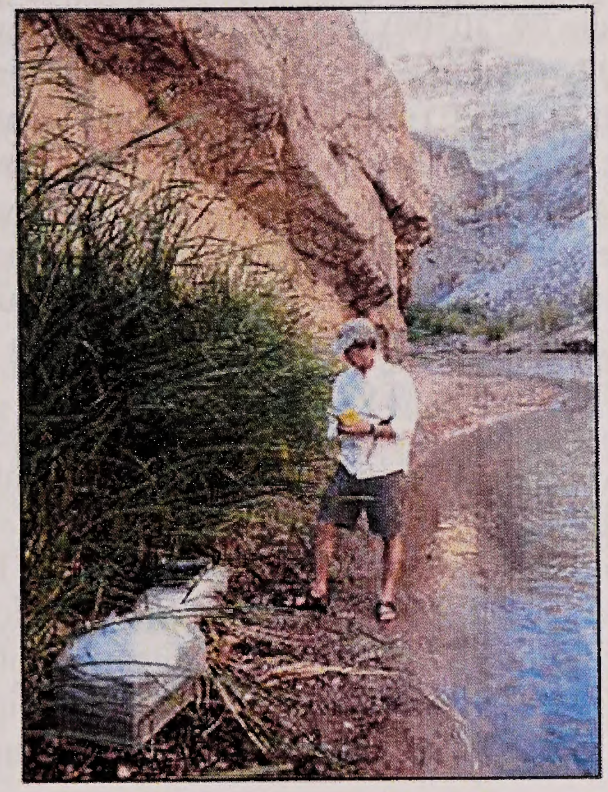


Figure 9 – Littlefield Spring, Mohave County, Arizona

The following data-collection activities have taken place during 2009:

- Field crews collected water samples from several of the springs in the Littlefield Springs complex. These samples have been analyzed for major constituents, several isotopic and geochemical tracers, and constituents used for groundwater dating. Analysis of these data is ongoing to determine the sources of groundwater discharged from Littlefield Springs and the approximate age of this spring water.

- Measurements of the amount of water discharging from Pah Tempe Springs were conducted in July using both a conventional acoustic flow meter and the tracer-dilution method. Concurrent water samples were collected and subsequently analyzed for major constituents so that salt discharge from Pah Tempe Springs could be determined. These were the first of several measurements of water and salt discharge that will be made at these springs.

- Discharge and specific-conductance measurements were made periodically at USGS monitoring sites throughout the Virgin River Basin and water samples collected from these sites were analyzed for dissolved-solids concentration. These data are being used to improve salt discharge estimates in the Virgin River.

Data collected during 2009 have been stored in the USGS National Water Information System (NWIS) database.

Monitoring Salt Loads Discharged from the Manila-Washam Salinity Control Project Area, Utah

During 2004-05, the USGS investigated the occurrence and distribution of dissolved solids in water from the agricultural lands near Manila, Utah, determined the amount of dissolved solids being discharged to

Flaming Gorge Reservoir (FGR), and subsequently reported the results in a Scientific Investigations Report (Gerner and others, 2006; available at http://pubs.usgs.gov/sir/2006/5211/PDF/SIR2006_5211.pdf).

The NRCS began implementing a salt-load reduction project in the Manila-Washam area during 2007 that involves converting flood irrigation to gravity-pressure sprinkler irrigation systems. As part of the project implementation, and in support of future projects, the USGS is monitoring the dissolved-solids concentrations in selected drains and seeps to observe changes that occur during implementation of the Manila-Washam Salinity Control Project (MWSCP).

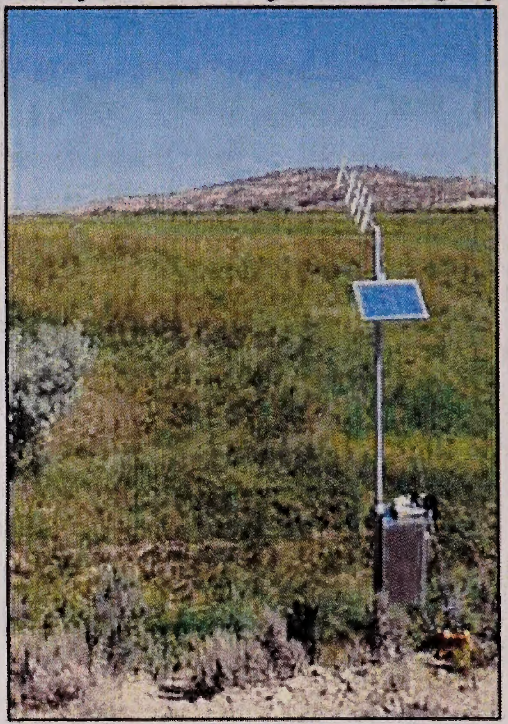


Figure 10 – U.S. Geological Survey water-quality monitoring site in Birch Springs Draw, Utah

The largest discharge of dissolved solids from the MWSCP area is from Birch Springs Draw (BSD). Consequently, a streamgage (USGS site 09230300) was installed near the outflow of BSD during May 2007. Discharge, specific conductance, and the water temperature of BSD streamflow have been continuously monitored since the gage was installed and these values are being reported on the web at URL http://waterdata.usgs.gov/ut/nwis/rt. Frequent site visits are being made to this gage to maintain and calibrate the instrumentation. In addition, frequent water-quality samples have been collected from BSD to define the relation between dissolved-solids concentration and specific conductance. Discharge and specific conductance or dissolved-solids concentration have been measured periodically at other major drains and seeps discharging directly to FGR from the MWSCP area. These periodic data and the continuous data collected at site 09230300 are being used to determine the net annual load of dissolved solids discharged from the entire MWSCP area. The project is ongoing; however, a report of preliminary findings for May 2007 through June 2008 (referred to here as the 2007-08 reporting period) was distributed in March. Key preliminary **findings of the study from the 2007-08 and 2008-09 reporting periods include:**

- During the 2007-08 and 2008-09 reporting periods there were 10,900 and 13,700 tons (provisional), respectively, of dissolved solids discharged to FGR from Birch Spring Draw. The dissolved-solids load discharged during these periods were much less than the 22,900 tons discharged during the 2004-05 reporting period.
- During the 2007-08 and 2008-09 reporting periods, the estimated net dissolved-solids load discharged into FGR from the Manila-Washam Salinity Control Project area was 19,500 and 23,900 tons (provisional), respectively. The dissolved-solids load discharged during this period was much less than the estimated 38,300 tons discharged during 2004–05 into Flaming Gorge Reservoir from the Manila-Washam Salinity Control Project area.

Arizona Department of Environmental Quality Cooperative Program

The Arizona Department of Environmental Quality (ADEQ) collects water samples for analysis of major ions, trace elements, and nutrients at the USGS gages located at Lees Ferry and Imperial Dam, both former NASQAN stations. Also, water-quality data are collected on the Colorado River at Parker Dam. Additional samples are collected at the Northerly International Boundary gage, to supplement NASQAN samples. Water at these sites is also analyzed for bacteria.

Report on Sediment Transport in the Bill Williams River during High-Flow Releases from Alamo Dam and Effects on Turbidity and other Water-Quality Indicators in Lake Havasu, 2005-06

In 2005 and 2006, releases from Alamo Dam were increased to approximately 6,000 and 2,000 cubic feet per second, respectively. The releases were used to study the effects of high flows on the river channel, habitat development, and effects on lower Lake Havasu. The USGS collected suspended-sediment data to quantify sediment transport at the mouth of the Bill Williams River and track turbidity and other water-quality parameters in Lake Havasu. A similar release from Alamo Dam was made during the spring of 2005 and the USGS collected sediment data in the Bill Williams River and measured water-quality parameters including turbidity in Lake Havasu during the event. The measurements quantify the delivery of sediment to Lake Havasu and the distribution of turbidity in the lake. The delivery of sediment to and distribution of turbidity in the lake is especially significant because of the proximity of the inlets to the Central Arizona Project. A report (*Sediment Transport in the Bill Williams River and Turbidity in Lake Havasu During and Following Two High Releases from Alamo Dam, Arizona, in 2005 and 2006)* has received Director's approval and is in the final stages of being published online.

Hydrologic Investigation to Forecast the Future Total Dissolved Solids Concentration of Water Pumped by the Lower Colorado Water Supply Project

Groundwater pumped by Lower Colorado Water Supply Project (LCWSP) wells is delivered to the All-American Canal (AAC) and exchanged, in like amounts, for withdrawals from the Colorado River by water users in California. If the salinity of the groundwater pumped by the LCWSP wells is less than 879 ± 30 milligrams per liter on an average annual flow-weighted basis, it is deemed acceptable for delivery to the AAC. LCWSP well water may be rejected in whole or in part if the salinity does not meet this criterion. This water quality criterion has been temporarily waived until at least January 1, 2027. The complete, 3-phase, study will investigate the groundwater system near the LCWSP well sites, and will estimate the long-term (tens of years) impact on the salinity of the water pumped by LCWSP wells from all sources. The study will also examine long-term changes in those sources, including the immediate and long-term impacts of the current project to line portions of the AAC, scheduled to be completed by June of 2010. Phase 1 of this study began in 2009 and consists of establishing a monitoring network and completing an initial characterization of the groundwater system. Phase 2 of this study consists of a comprehensive investigation of the groundwater system, including water quality, and its relation to the LCWSP. Phase 3 consists of the development and application of a numerical model of the groundwater system.

Identification and Analysis of Points of Diversion along the Lower Colorado River in Support of Decree Accounting

The U.S. Supreme Court decree, 1964, Arizona v. California, is specific about the responsibility of the Secretary of the Interior to account for consumptive use of water from the mainstream: consumptive use is defined to include "water drawn from the mainstream by underground pumping." Water pumped from wells on the flood plain is presumed to be Colorado River water and the accounting surface can be used to identify wells outside the flood plain in and near the lower Colorado River valley that yield water that will be replaced by water from the river. The objective of this cooperative project between the USGS and Reclamation is to inventory points of diversion including river pumps diverting river water and wells on the lower Colorado River flood plain and adjacent areas in Arizona, California, Nevada, and Utah. Work on the project began in April 1994 to locate sites, provide current information for each well, and provide precise position information in order to apply the accounting-surface method and include the appropriate wells in water accounting along the river. Water levels are required where possible for all wells in areas adjacent to the flood plain. Over 8,000 wells have been inventoried in the river aquifer along the lower

Colorado River. Data on over 11,650 wells, 85 springs, and 310 river pumps in Arizona, California, and Nevada have been entered into the USGS Arizona Water Science Center database and sites in California and Nevada are being entered into the California and Nevada Water Science Centers databases. Site and water-level data are available on the Web within one day of entry to the NWIS at http://waterdata.usgs.gov/nwis and data are uploaded quarterly to an interactive mapping link at http://az.water.usgs.gov/projects/LCRS/.

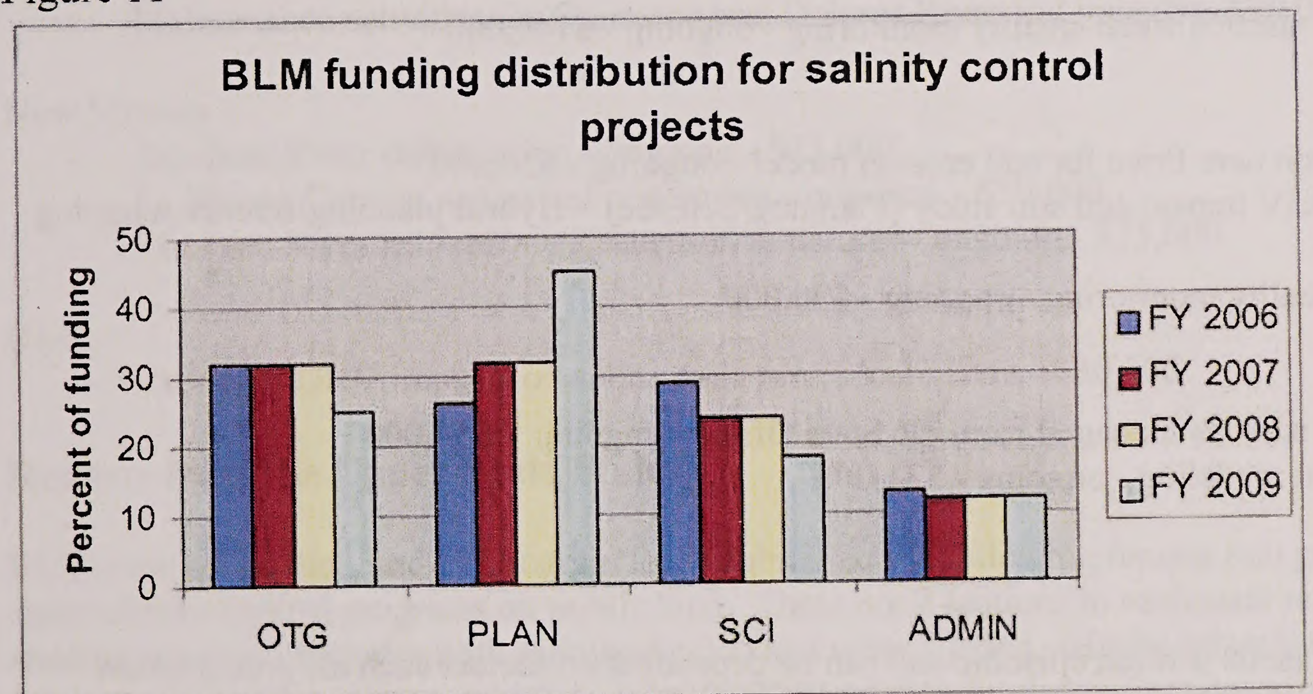
Bureau of Land Management
Colorado River Basin Salinity Control Program
Accomplishments for Fiscal Year 2009

The Bureau of Land Management (BLM) is committed to its role in reducing the mobilization of salt on public lands. The BLM undertakes this responsibility through the multitude of individual management decisions that are made within each BLM jurisdiction. Progress in preventing salt from moving off BLM land is achieved largely through efforts to minimize any soil erosion impacts of grazing, recreation, and energy development, protect riparian areas, reduce off-road vehicle impacts, conduct prescribed burns, and generally manage vegetative cover and reduce erosion. As such, in the past, it has been difficult to single out salinity-control efforts for many of the projects that did have salt savings. In a step to strengthen our reporting effort, a restructuring of the allocation of salinity funding was done and new tracking and accounting systems were put in place in FY 2006. Thus, FY 2009 is the 4th year of reporting under the re-structured system.

General Summary

For FY 2009, $800,000 (same as FY 2008) was allocated for BLM's salinity-control program. Funding goes to four major areas: Program administration (ADMIN); Planning (PLAN); Science (SCI); and On-the-ground implementation projects (OTG) (see Figure 11 bar chart below for FY 2006 - 2009).

Figure 11



Tons of salt retained cannot be calculated for program administration, planning, and science projects. However, one of the goals for the re-structured program in FY 2006 was to develop an accounting system to begin calculating more reliable 'tons of salt retained' for on-the-ground implementation projects. At the end of BLM's section there is a spreadsheet entitled: *BLM Salinity Program – FY 2009 Annual Report for Implementation Projects* (i.e., on-the-ground tons of salt retained).

The information below provides the narrative portion of our annual report.

Program Administration

During FY 2003, BLM created a new full-time, salinity coordinator position. The salinity coordinator began work in FY 2004. FY 2006 was the first full year of the newly re-structured program. The re-structured plan consists of 3 main parts: (1) Allocation of funds to the Upper Basin States (AZ, CO, NM, UT, and WY) based on submittal of project proposals; (2) A tracking system for projects that fit into BLM's Rangeland Improvement Project System (on-the-ground implementation projects); (3) Annual reporting consisting of narratives for on-going and current year, and a worksheet to determine 'tons of salt retained' for on-the-ground implementation projects. The objective for FY 2007 – 2009 program administration was a continuation of the framework put into place during FY 2006; however, there has been an increased emphasis on capturing salt loading for more implementation projects (OTG). Projects that have been science or planning can become implementation projects in future years.

Planning

Planning is an important part of natural resource management. Resource management plans become the 'blueprints' for BLM's near future. As such, this is an opportunity to plan for salinity control, especially for some of our most important activities on public land such as energy development, grazing, and recreation. Planning projects that successfully captured salinity funding for FY 2009 include:

Colorado

- North Desert Salinity, Restoration near Fruita for off-highway vehicle designation - ongoing - $15,000
- Piceance Basin baseline water-quality monitoring - ongoing - $140,000

Utah

- Nine Mile Canyon near Price for soil erosion model - ongoing - $30,000
- Factory Butte OHV impact and soil study (Planning/Science) – Hybrid planning/science, ongoing - $25,000
- Pariette water-quality monitoring - ongoing - $90,000

Wyoming

- Progressive soil surveys managed from the State Office - ongoing - $54,000
- Erosion sediment modeling - ongoing - $31,000

Science

Salt loading from public lands is often episodic and can be dependent on factors such as: precipitation amount and intensity; topography; content and texture of soils; and the types, amount, and architecture of vegetative ground cover. The transit mode of salt loading can be surface-water runoff, or it can be ground-water recharge to streams and rivers. In a watershed, understanding which factors are most important and what is the main transit mode of salt loading can necessitate an investigation prior to determining the proper on-the-ground implementation project for good salinity control. The following science projects to investigate salt loading factors were funded during FY 2009:

Colorado

- Vegetation and soil stability project with USGS Biological Resources Discipline (BRD) in Badger Wash (central-western Colorado) to investigate grazing impacts on vegetation and sediments - ongoing - $35,000
- San Luis Valley wetlands salinity study $10,000

Utah

- Factory Butte OHV impact and soil erosion study - ongoing - $25,000

Wyoming

- Transport dynamics of salinity/sediment - ongoing - $25,000

Upper Colorado River Basin Regional project

- Forecasting phenological plant stage in the Upper Colorado River Basin - ongoing - $50,000

On-the-Ground Implementation

When mechanisms of how salt loading occurs are understood and once planning is done, on-the-ground implementation projects follow. The success of an on-the-ground project is very much tied to understanding system mechanics and proper planning. The success is also tied to sufficient funding and trained natural resource personnel to go out in the field and construct or carry out the plan.

On-the-ground projects funded by salinity program allocations during FY 2009 include:

Arizona

- Rock Crossing dike system in Ft. Pierce Wash that is tributary to the Virgin River southeast of St. George, Utah - $50,000

Colorado

- Maintenance activities for Gunnison and Dolores River watersheds - $20,000

New Mexico

- San Juan River stabilization - ongoing - $35,000
- La Manga Canyon watershed restoration - ongoing - $50,000
- San Juan River salt/sediment retention structures - ongoing - $15,000

Utah

- Reducing OHV impacts on saline soils near Moab, Utah - $30,000

Reports from the Upper Basin States

BLM state soil, water, and air program leads submitted the following reports that give more detail on their state salinity-control programs on public land. There are 2 sections to each state report: a **General summary**, which includes both salinity-funded and other-funded, salinity-related work; and, a **Specific project summaries** section, which is only FY 2009 salinity-funded project descriptions and update reports.

Arizona

General Summary

Table 3 – Arizona Strip Accomplishments and Tons of Salt Retained in FY 2009

Accomplishments	Estimated Tons of Salt Retained Yearly
Rock Crossing dikes – Repairs on one large and one small breached dike in upper Hurricane Valley were done in the Fall of 2009. Saline sediments and waters are trapped behind the dikes after every storm event. Priority One, Fort Pierce Wash Sub-basin, HUC 1501000904	414
Clayhole Well Dikes – Repairs on 4 dikes were done in the Fall of 2008. Saline sediments and waters are being trapped behind the dikes. Priority One, Fort Pierce Wash Sub-basin, HUC 1501000902	96
Repairs on the Big Warren dikes were done in 2007. They are still successfully trapping saline sediments and detaining salty waters. Priority One, Fort Pierce Wash Sub-basin, HUC 1501000902	345
Flattop Dam – Saline sediments continue to collect behind the repaired (in 2001) dam on a yearly basis. Priority One, Fort Pierce Wash Sub-basin, HUC 1501000902	1,280
7 dikes in the saline Upper Clayhole Valley and 2 dikes in the saline Hurricane Valley area were assessed for their condition.	**NA
Over 200 miles of road maintenance were done.	10
Range Standards and Guides assessments were done on 90,000 acres of allotments containing saline soils. AMPs are being revised to address problems on the saline soils.	45
Cattle were temporarily removed from some recently burned allotments.	10
Mt. Trumbull RCA, Ponderosa Pine, pinyon/juniper thinning and restoration on 300 acres. Forests are mechanically thinned to reduce extreme fire behavior potential, which can result in severe runoff and erosion. Sparse under-stories are improved by seeding grasses to reduce existing erosion. Priority One, Fort Pierce Wash Sub-basin, HUC 15010009	15
ESTIMATED TOTAL TONS OF SALTS RETAINED IN 2009	**2,205**

**Not all work related to salinity results in direct salt retention. Data and information gathering, and planning, sets the stage for future salt retention projects.

Specific Project summaries

Salinity funding helped support one Arizona BLM implementation project in FY 2009:

The Rock Crossing dike system, a component of the Fort Pierce flood and salinity control system, consists of 5 large and 5 small spreader dikes. There are 10 detention dams, 142 dikes, and over 60 check dams in the saline Fort Pierce sub-basin, which is over one million acres. Most of the structures were built in the 1960s. The condition of the structures needs to be assessed every few years. Nine of the dikes were assessed in 2009. Ft. Pierce wash is a tributary to the Virgin River, which flows into the Colorado River. Below are photographs of FY 09 repairs to this system.

Colorado

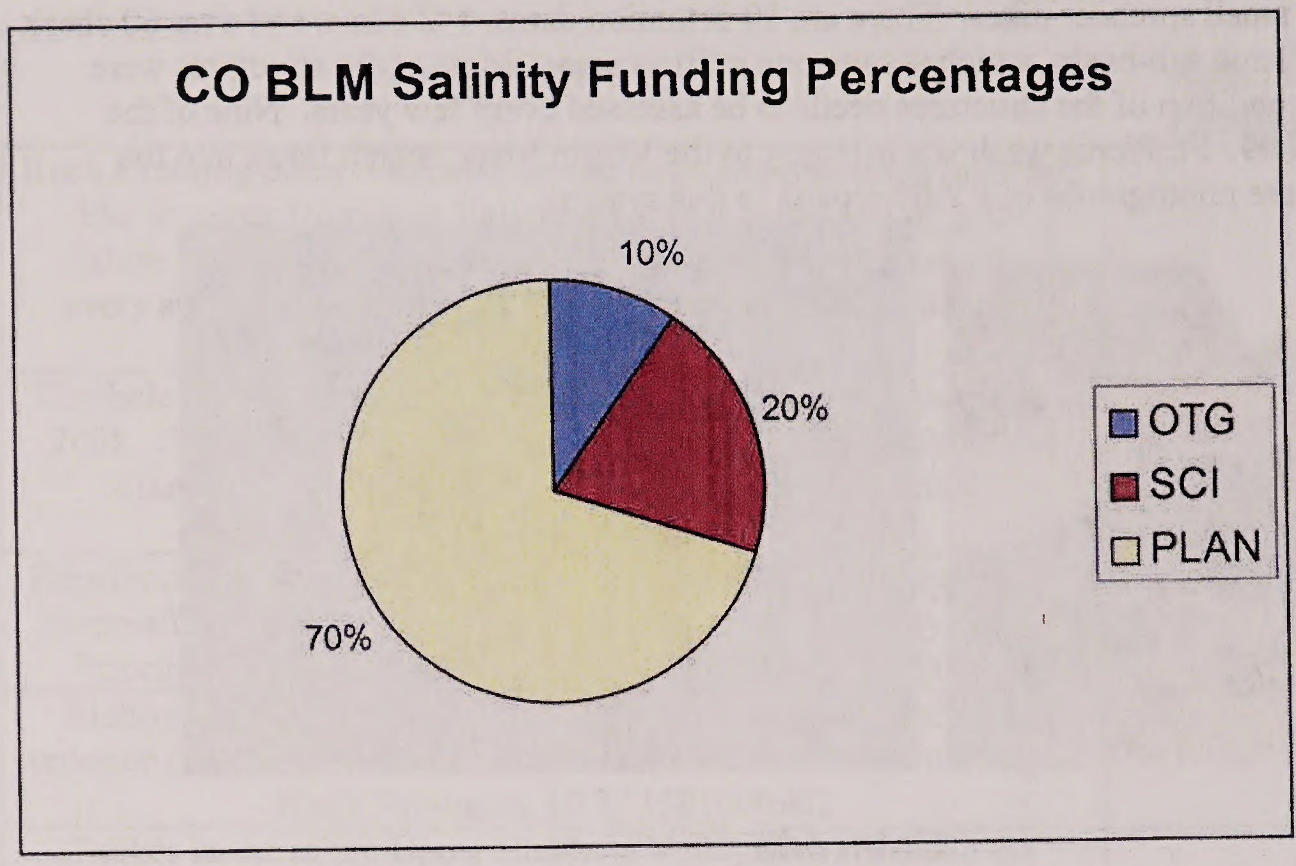
General summary

The BLM in Colorado (CO) is committed to its role in reducing the mobilization of salt on public lands. The BLM maintains and reduces salt delivery to the Colorado River through planning, NEPA analysis and associated management decisions at four CO Field Offices. It has been determined (in the past) that saline soils predominate in the Uncompahgre, White River, San Juan, and Grand Junction Field Offices. Salinity control projects are funded directly through Washington, D.C. BLM soil, water, and air program.

Recreation, OHV use, grazing, and energy development activities can increase salt delivery by reducing vegetative cover. Best management practices (BMPs) need to be implemented properly. Planning is the first step in the BMP process. Energy development of oil, gas, and shale oil has increased in Colorado since the passage of the Energy Policy Act. Progress in preventing salt from moving off of BLM land is achieved through efforts to minimize the impacts of grazing, protect and enhance riparian areas, designate OHV corridors, conduct prescribed burns, and basically manage and enhance vegetative cover to reduce erosion.

Specific project summaries

Figure 12 – State funding by category



White River Field Office (Meeker, CO):

USGS Monitoring: This project allowed for the adding of conductivity meters on two USGS Streamflow sites on Piceance Creek, which is tributary to the White River. These new meters provide conductivity values every 15 minutes and are available on USGS' website (http://waterdata.usgs.gov/nwis). The stations are 09306200 Piceance Creek below Ryan Gulch, Near Rio Blanco, Colorado and 09306222 Piceance Creek at White River, Colorado. These sites are important to understand potential impacts from oil and gas development in the area and also understanding the salinity loading of Piceance Creek. There are ground-water inputs into Piceance Creek below the Ryan Gulch site and before the White River site in an area called Alkali Flats. In addition to this natural input of salt into the system there is a tremendous amount of water use upstream from irrigation and energy development. This project continues to support three stations on the White River that measure conductivity among other parameters.

BLM Monitoring: In addition to the support of USGS streamflow measurement and water quality monitoring this project allowed for the establishment of a new streamflow site on Piceance Creek monitored by the BLM. This site is directly above the Alkali Flats area and BLM lands and allows the water inputs to Piceance from ground water to be measured. An additional 2 precipitation gauges have been established in the Piceance Creek watershed and will be monitored in future years. An extensive inventory of springs in the Piceance Creek watershed was also conducted. This information can be critical to identifying potential impacts from oil and gas development as well as determining what geologic formations are likely contributing salt loading to the Piceance Creek watershed.

Figure 13 – Piceance Creek Streamflow Measurement Site on BLM Administered Lands

Uncompahgre Field Office (Montrose, CO):

Gunnison Gorge National Conservation Area (NCA) Science: This project uses scientific research results and ongoing monitoring techniques to improve management of Mancos shale derived soils to reduce sediment, salinity, and selenium yields from the Gunnison Gorge NCA. The project also identified source areas for invasive weeds, including: salt cedar, white-top, and Russian knapweed. The project goal is closely tied to the Gunnison Gorge NCA, Resource Management Plan. Primary objectives of this project are to: apply scientific findings from past and ongoing research to management actions in the NCA to minimize sediment, salinity and selenium yields by identifying and inventorying a series of earthen check dams, and develop a strategy to stabilize eroding structures and restore more natural hydrologic function to the affected drainages. The subject check dams are located on soils derived from Mancos shale and were constructed in the 1960s, to reduce sediment loading, downstream in the Uncompahgre and Lower Gunnison Rivers. During 2008, a Geological Society of America Intern, Hillary Kruger used the GIS based LIDAR coverage of the NCA Mancos shale areas to identify all visible check dam structures in the Peach Valley and Candy Lane drainages. When complete, she tallied approximately 1,260 structures, which varied in size from 1 foot high and 20 feet long, to 20 feet high and 150 feet long. We then designed a series of field procedures to inventory and assess the check dams, all of which is electronically downloadable from field instruments to PC based databases. Physical features such as dam size, length, and slope were recorded, as well as dam condition, pond functionality; up and downstream channel condition, and presence and density of invasive weeds. In all, 960 of the 1,260 were inventoried during the 2008 field season with all data successfully downloaded and stored in Excel and GIS databases. In 2009, the inventory is being completed and we are beginning the process of prioritizing the structures for weed treatment and stabilization. Due to personnel changes, land use planning effort, and wild and scenic analyses, 50-75 check dams were inventoried. It's anticipated this work will continue through a contract next fiscal year.

Grand Junction Field Office (Grand Junction, CO):

The North Desert salinity project funding was used to clean out 5 reservoirs in this area, which are likely to have beneficial impacts to reducing salinity. It was estimated that between 50 – 100 cubic yards of sediment was removed from these ponds.

Badger Wash:

Water Erosion:

Silt Fences: We installed 20 silt fences at the base of slopes, with 10 fences in grazed and 10 fences in the ungrazed watersheds on different soil types. These fences collect water-borne sediments and were emptied five times during the year. Although the numbers are preliminary, it appears that silt fences in the grazed watersheds have collected substantially more sediment.

Runoff collectors: We have had three events that have tripped the water collectors. However, this runoff only occurred in the grazed watershed. The same storms did not trip the collectors in the adjacent ungrazed watershed. This is likely due to the higher cover of vegetation in the ungrazed watershed. Water samples will be sent in for analysis.

Ponds: Unfortunately, there have not been any events large enough to fill the ponds, and thus no measure of total runoff has been collected.

Wind Erosion:

Wind tunnel experiments: We are currently conducting wind erosion experiments in the watersheds. We have run the wind tunnel on seven of the planned 10 sites (5 soil types). So far, disturbed soils have produced 4.5 times more sediment than undisturbed soils. The rest of the sites will be finished in the next few weeks.

Dust collectors: We have established eight dust collectors, four in a grazed watershed and four in the adjacent, ungrazed watershed. Dust collected was highly variable among the collectors. However, preliminary data would indicate that dust production is higher in the grazed watershed as compared to the ungrazed watershed.

Jayne Belnap with the USGS is leading a paired watershed study to determine effects of grazed areas on salinity, biological soil crusts, and erosion. Un-grazed watersheds will be used as a *control*, and as a basis for comparing impacts.

San Juan Public Lands Center (Durango, CO):

$20,000 initially reserved for Disappointment Valley was re-directed to the USGS project in the Piceance basin for surface and ground-water monitoring.

New Mexico

General summary

Dixie Harrow Watershed Restoration Project: Approximately 1,000 acres of sage/grassland located in the Palluche Wash drainage, 234 acres on Crow Mesa, and 30 acres on Big Blue Mesa were treated with a Dixie Harrow to thin about 30 to 70 percent of the sage. A mix of cool season grasses and forbs was spread (simultaneous to the harrowing) by a broadcast seeder attached to the front of the rubber tired tractor pulling the harrow. About 1.5 miles of road were closed on Crow Mesa, recontoured and reseeded. The treatment will result in reinvigoration of the remaining sagebrush, the establishment of additional grasses and forbs, and a long term reduction of erosion within the watershed.

Road Improvements: Approximately 800 miles of road have been regularly maintained and approximately 20 miles of road were reconstructed to meet road standards. BLM's Civil Engineering technician developed the San Juan Public Roads Committee. This committee includes oil and gas producers, members of the local ranching community, and the Forest Service. The committee has developed road units and has organized and cost shared maintenance activities. This committee has greatly improved the conditions of the local dirt roads and has helped reduced the amount of sediment reaching the river systems from the road network.

Vegetation Treatments: Pinyon-Juniper and sagebrush were selectively thinned by chainsaw to promote the grass production in approximately 152 acres in Escrito drainage, 15 acres in Sandstone drainage, and 10 acres of Trial Canyon. These projects help curtail soil erosion and promote improved watershed function.

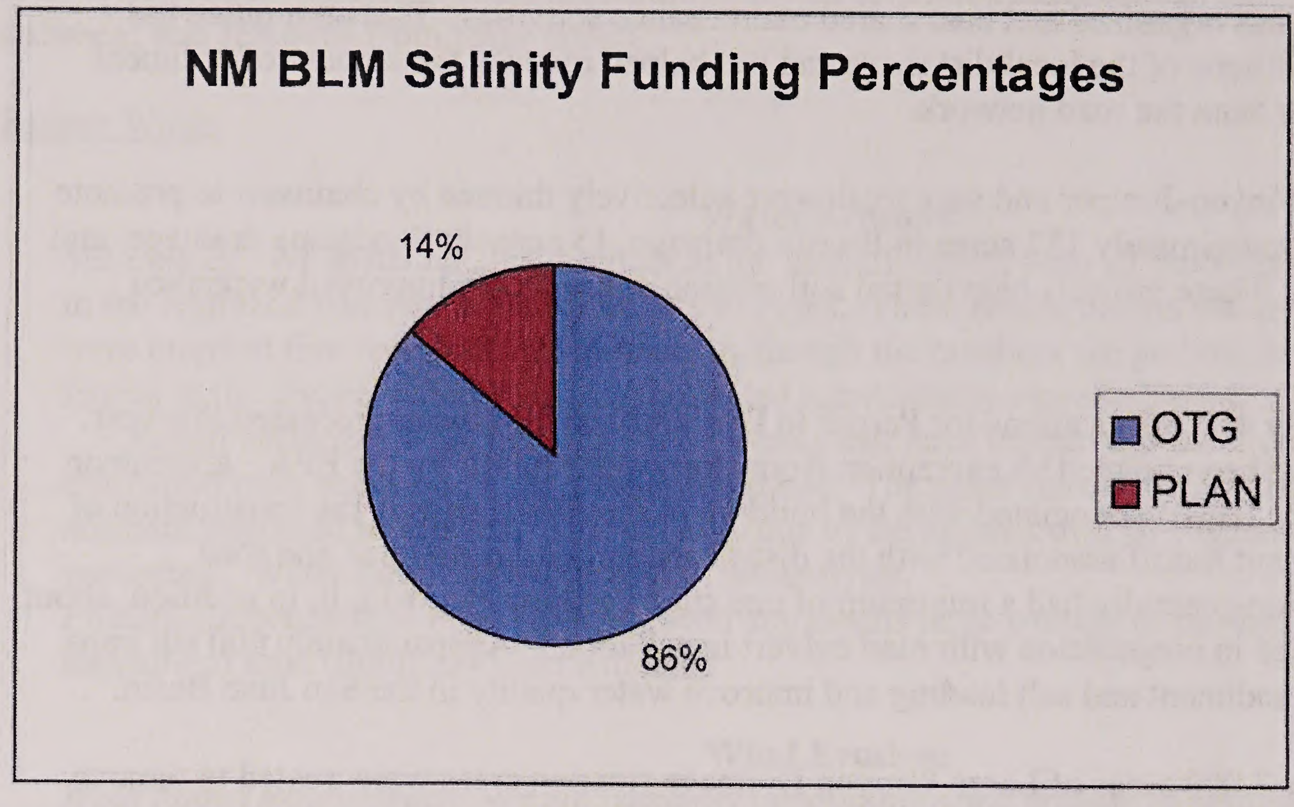
Silt Traps: Approximately 410 Applications for Permit to Drill (APDs) have been processed this year. Oil and gas operators have been granted an exemption from stormwater runoff by the EPA. A common Best Management Practice (BMP) associated with the building of these well pads is the construction of silt traps to contain sediment runoff associated with the disturbance from the well pad and road construction. Each location generally had a minimum of one silt trap associated with it; in addition, about 200 silt traps were installed in conjunction with road culvert installations. Approximately 600 silt traps were built to help curtail sediment and salt loading and improve water quality in the San Juan Basin.

Riparian: Approximately 2,000 acres of Largo Canyon Drainage riparian areas were treated to remove non native Russian olive trees. Crews cut the Russian olive trees with chain saws and the freshly cut stumps were treated with an application of herbicide, and the slash was chipped. Saltcedar was removed from riparian areas along the San Juan River and from test plots in Largo Canyon by both hydromowing and chain saws. A cut stump application of herbicide was applied to kill the saltcedar root system. After removal of saltcedar, native riparian vegetation is expected to reestablish on these sites. Exotic vegetation was removed from a five acre wetland on the San Juan River to promote native vegetation. About 80 fences were constructed around individual cottonwood trees along San Juan and Animas rivers to protect the trees from beaver damage.

Roads Workshop: A Federal Clean Water Act Section 319(h) grant was awarded to hold a road maintenance educational workshop to demonstrate techniques that would improve road construction and maintenance and should lower the cost of maintenance long-term while reducing erosion potential. This workshop is a cooperative effort that involves the oil and gas industry, BLM, grazing permittees, and interested public with the goal of better roads and reduced erosion along roadways. Lectures and field trips have been conducted to demonstrate road building techniques that minimize erosion and maximize water retention to promote vegetation growth. A video entitled "Maintenance of Oil & Gas Roads with Bill Zeedyk" was an important production that came out of this workshop.

Specific project summaries

Figure 14 – State funding by category



La Manga Canyon Watershed Restoration: Archeological surveys were conducted on about 150 acres of the La Manga Canyon watershed, and 5 test plots totaling about 100 acres were reseeded with grasses and forbs to stabilize fragile soils. Erosion check dams were constructed in 17 locations in the La Manga drainage to trap sediment and reduce the energy of storm runoff events. In addition, bank stabilizations structures within La Manga drainage were maintained to reduce sediment entering Pump Canyon – a tributary to the San Juan River. A pasture fence in the La Mange drainage was also rebuilt to control grazing in riparian areas of Pump Canyon.

San Juan River Stabilization: Exotic Russian olive trees and saltcedar were removed from a 10 acre site along the San Juan River and an administrative access road was improved in conjunction with a joint project with the City of Bloomfield to create a six acre wetland. After the Russian olive and saltcedar were removed, the site was sprayed for noxious weeds prior to the flooding of the new wetland.

San Juan River Salt Retention: Farmington BLM coordinated with the Farmington Public Schools Youth Conservation Corps (YCC) program to build Sediment fences in Blanco Wash – a tributary to Largo Canyon. The project consisted of construction of 18 fences along about ¼ mile of the bank. The fences were designed to stabilize the bank, catch sediment, and promote the establishment of riparian vegetation on the newly deposited sediment. The Farmington Public Schools provided eight workers from the YCC program to help construct the project.

Utah

General summary

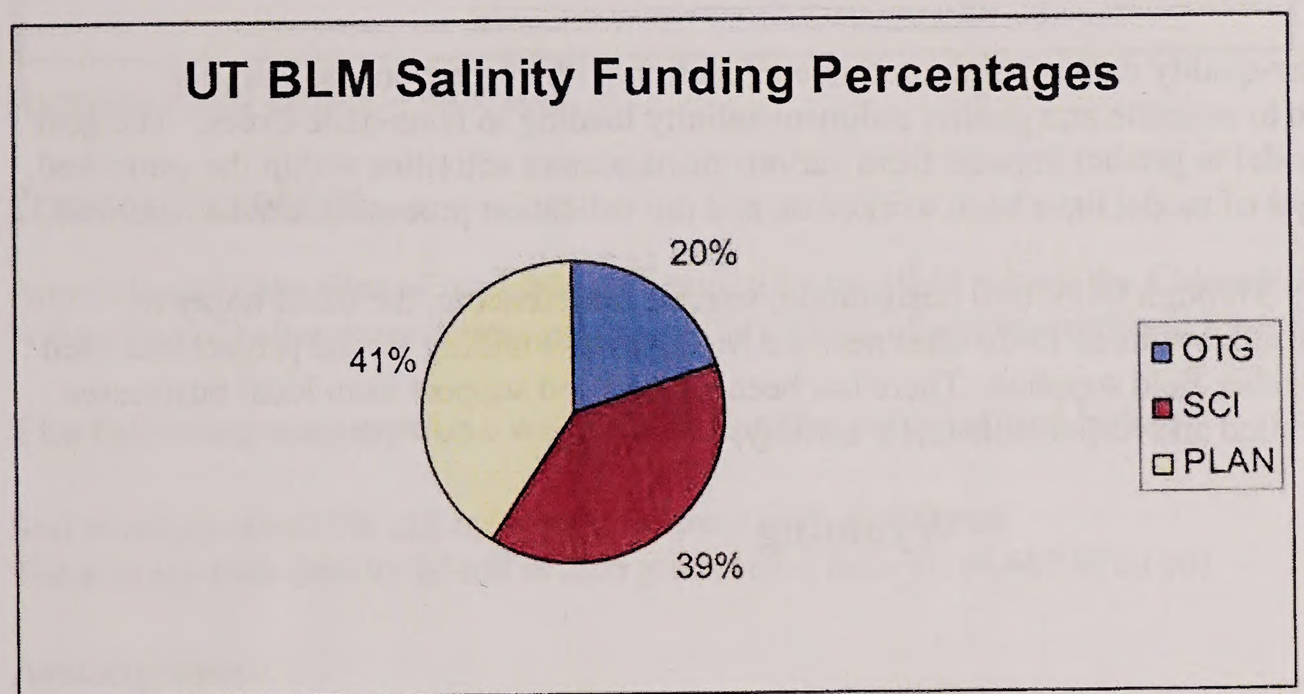
The following paragraphs provide examples of the types of projects that have been implemented that have benefits to the salinity program and are expected to reduce saline runoff and erosion from BLM lands. The first several items are statewide activities and the rest are examples of site specific projects.

Climatic Studies: Utah has had a long-term climate monitoring program. Data are used in project planning as well as for interpreting results from other monitoring data such as silt fences and sedimentation studies. Funding was used to implement crucial upgrades and maintenance of equipment. These upgrades were initiated in FY 2007 and will be completed at the end of FY 2009. In addition to updating, standardizing, and automating equipment, partnerships are being developed with local entities and the Utah State University (USU) climate center to use and manage the data. These data will be merged with other data sets and used in longer-term climate analyses in Utah's portion of the Colorado River Basin as well as interpreting ongoing studies related to salinity and erosion within the state.

Soil Surveys: Continued soil survey efforts resulted in completion of over 202,000 acres primarily in Emery, Kane, and Sevier Counties. Soil survey inventory can provide better soil salinity and potential erosion information that can be used in project planning and for prioritizing areas for restoration.

Specific Salinity Project Summaries

Figure 15 – State funding by category



Pariette Wetlands: is a large artificially-augmented wetland in the northeastern portion of Utah. This has been a long-term, multi-faceted project operating and monitoring the wetland area for wildlife management and salinity/water-quality control. This FY, water samples were collected at two sites. One site is below the Flood Control Dam at the head of Pariette Wetlands and the second site is below the Red Head Pond approximately one mile above the Green River. Data collected included flow (cfs), specific conductance (uS/cm), temperature (deg C), pH, dissolved oxygen (mg/l), and salinity (ppt). Data were collected monthly and sent to the Utah Department of Environmental Quality, Division of Water Quality. We also collected data using a Hydrolab recently purchased by this Office. We compared the new data with the previous year's data and data collected in the late 1970s, 1980s, and early 1990s. Comparison of these water quality data assists us in determining the effectiveness of the wetland development over time, BMPs on the oil and gas development on the Myton Bench, and planning maintenance. The Pariette effort was done in conjunction with Utah State University Uintah Basin Pariette Intern Program. Utilizing this program has enabled us to sample other streams in the Field Office area. We have been able to leverage our money with in-kind service from the University to realize more monitoring. A Utah State University student through an intern program helps with this project, often taking on the work of gathering field data from streams.

Factory Butte OHV study: A long-term study was initiated summer 2007 in the Hanksville area of Central Utah. This is a collaborative project with USGS BRD, Mineral Resource Team (MRT) and Utah State University to assess soil and water quality impacts related to OHV use on Mancos Shale in the Factory Butte. Initial work included installation of 6 pairs of silt fences and extensive inventory of soil surface features in disturbed and undisturbed areas. The silt fences are being used in a controlled study comparing OHV disturbed and undisturbed slopes. The initial soil characterization work was used in developing a more comprehensive study design and prioritizing areas for more intensive study. Data collection began in the summer of 2008 including wind study, dust collection, and geochemical analysis. Part of this project also includes evaluation of relatively new technology in utilizing LIDAR imagery to assess micro changes in surface features and measure erosion rates. During FY 2009, working with USGS Geologic Division and the USGS Utah Water Sciences Center (Cedar City), water samplers, pressure transducers and temperature/conductance probes were installed in the Fremont River and Nielsen Wash (tributary to the Fremont River) to assist us in determining the amount of salt being contributed from different reaches along the river. All of this work is being conducted in conjunction with planning efforts and changes in BLM travel management to improve conditions and reduce erosion and soil/water-quality impacts. The bulk of the study work is expected to be completed in FY 2010; however, silt fence monitoring may be continued longer term.

Nine Mile Canyon: Water-quality data is being used in conjunction with vegetation and land use (disturbance) information to estimate and predict sediment/salinity loading to Nine-Mile Creek. The goal is to be able to use the model to predict impacts from various management activities within the watershed. In FY 2009 the final stages of model have been worked on and the validation process is almost complete.

Salinity Reduction/OHV: Through OHV trail designation, signage, and fencing, the BLM hopes to reduce surface erosion of saline soils at 15-20 sites near the Moab area. Funding for the project was used for fencing, seeding, and other field supplies. There has been widespread support from local businesses and user groups for controlled and responsible OHV activity.

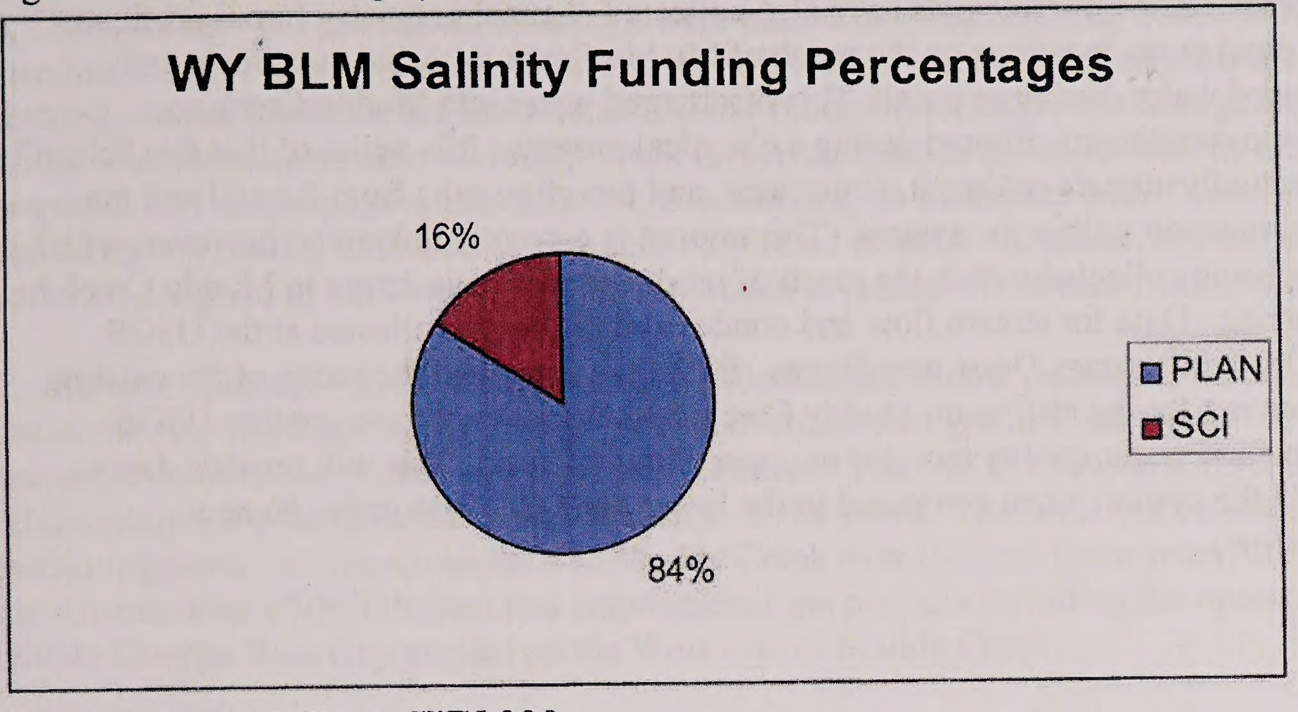
Wyoming

General summary

The following is an estimate of the amount of salt retained on the landscape within the Upper Colorado River Basin due to projects completed by the Rawlins, Rock Springs, Kemmerer, and Pinedale Field Offices in FY 2009. A narrative is also included describing management actions that encourage healthy watershed characteristics that may lead to less erosion and salt contributions to the Colorado River. It is recognized that surface disturbance has increased due to BLM approved activities, mostly oil and gas development, and this may reduce the effectiveness of these salinity control projects and related management actions. This report was written in August 2009, so some projections into the future have been made for the remainder of the fiscal year.

Specific project summaries

Figure 16 – State funding by category



Rawlins Field Office – WY 030

Projects Completed

Approximately 50 miles of road was maintained by the BLM within the Colorado River Basin. Following the below assumptions approximately 7 tons of salt was retained for the year.

The following assumptions were made for the calculations below:

Soil averages about 3% salt by weight for most soils in the area
The average bulk density of soil is 2.65 g/cc (165.4 lb/cu ft) (4,467 lb/cu yd)

Assumptions:

2 cubic yards (cu yd) of soil are retained per mile of road maintained

50 miles * 2 cu yd/mile * 4467 lb/cu yd * 0.03 lb salt/lb soil = 13,401 lb salt = 6.7 tons of salt for the year

Point Sources

No point sources were addressed in 2009; however, previous well plugging efforts are still effective. Two projects to plug and abandon wells (Cow Creek Unit 3-12 and Wild Cow Creek well) are scheduled to be completed in late FY 09 or early FY 10. There is no water discharge from the Cow Creek 3-12 well, so it is assumed no salt transport is occurring at that wellhead. There is variable flow from the Wild Cow Creek wellhead which pools in a depressional area and overflows into a channel at certain times of the year. This connection is direct to the Wild Cow drainage which flows to Muddy Creek and into the Little Snake River. It is difficult to approximate the amount of salt that would be prevented via erosion from entering the Colorado River Basin from the plugging of this well, but it is estimated to be rather minor.

The Record of Decision for the Rawlins Field Office Resource Management Plan was released this spring and is currently in the implementation phase. Last year a surface water discharge of produced water under the freshwater waiver for the Colorado River Basin Salinity Control Forum was authorized into a

private section of Muddy Creek and the company discharged for approximately 1 to 1.5 months. Currently produced water surface discharge is not occurring anywhere in Muddy Creek. For the above mentioned produced water discharge, water quality samples and flows have been collected at those locations on a monthly basis. BLM hydrologists have also collected channel geometry (cross sections and longitudinal profile data) at six locations on the reach of Muddy Creek to include upstream and downstream of the produced water discharge point. This discharged water into Muddy Creek was desalinated and major ionic constituents filtered during a chemical process. It is believed that this "clean" water when discharged actually attracts sediment, major ions, and therefore salts from the soil and may actually increase salinity transport within the system. The amount is currently unknown; however, water quality and flow data are being collected within the reach of produced water discharge in Muddy Creek to see if this is indeed occurring. Data for stream flow and conductivity is being collected at the USGS streamgage for Muddy Creek at Youngs Draw near Baggs. BLM has expanded the scope of the existing USGS Interagency Agreement for the station on Muddy Creek near Baggs to include another USGS stream flow gaging station and water quality monitor in upper Muddy Creek. This will provide data to assess salinity transport in the system when compared to the lower gage (see also under #6 new streamgage discussion below).

Nonpoint Sources

1. **Vegetation Treatments** – Prescribed burns were completed on nearly 50 acres in the headwaters of the Colorado River System to improve range conditions. The number of acres treated was lower this year mainly due to weather conditions and very wet spring and summer seasons. There are still many burns planned and ready to be implemented. These prescribed fires are typically in sagebrush areas with large percentages of dead or decadent older plants or in aspen communities with conifer encroachment. It is anticipated that this will allow for a healthier mosaic of diverse age classes in these systems and will decrease erosion rates in the long term.

2. **Grazing Management** – In general, grazing rates were reduced again in 2009 due to recovery from recent drought conditions. This year's precipitation was far more normal (setting a record for the most amount of rain to date and in the month of May year to date) with lots of rain in the spring and throughout the summer months. The Rawlins Field Office (RFO) has continued to improve grazing management by increasing water sources and numbers of pastures allowing for the implementation of timing and intensity changes to improve range conditions.

3. **Wild Horse Management** – A horse gather is scheduled for October 30th in the Red Desert complex of the RFO. The horses will be gathered at Stuart Creek (209 horses planned to be shipped) and Lost Creek (230 horses planned to be shipped). Although these are not within the CRB, they are noteworthy as horses managed within the RFO including the CRB are within heard management goals.

4. **Water Development** – There is one water development project, the JO Ranch, planned for construction this FY 09. This in-stream project was planned to construct a type of spreader dike (dam) to stabilize a deep and migrating head-cut on Cow Creek in the Muddy Creek system. The project will help raise the water table by storing about 1-2 acres of water for livestock and wildlife use. Salts would be accumulated within the system and be prevented from migrating downstream unless there is a flushing effort, but more than likely the reservoir will be drained by bypassing the water and allowing the remaining water to evaporate. It is difficult to quantify the amount of salt retained by the project due to the fact this area (an upper tributary of the Cow Creek watershed) has different soils and is located some distance above Muddy Creek. The project is not expected to reduce salts due to the increase in groundwater movement in saline soils, but would tend to reduce peak flows and thereby reduce salt mobilization from eroded channels during storm events. The development of water sources in uplands in pastures with riparian or wetland areas have continued as well as fencing springs to reduce erosion.

These practices help protect the condition of riparian areas, and presumably result in salt retention by reducing erosion and storage of salts in wetland plants.

5. **Structures** - No permanent structures were placed in streams during 2009. However, the structures mentioned in previous reports for this area are still operational and typically are designed to arrest erosion features such as headcuts, the most notable is in Muddy Creek above the George Dew Wetlands. A new bridge was constructed across Muddy Creek on private land in the upper Muddy Creek (where the proposed new streamgage is located). BLM is working on a contract with Trout Unlimited to remove an old culvert on Muddy Creek on the Bridger Pass Road in 2010. A stream restoration project, including a structure designed to allow fish passage, is planned to protect the stream from any elevation change.

6. **Stream Gaging** – BLM is continuing to collect baseline data on Muddy Creek, the major tributary out of the Atlantic Rim CBNG Project area, to evaluate changes in Total Dissolved Solids (TDS) from non-point sources and potentially from point sources. The USGS released a TDS/Conductivity relationship this year from the data collected over the years. This data will be extremely useful in evaluating non-point source impacts to Muddy Creek over the next three years, during implementation of the Atlantic Rim CBNG Project and conventional gas projects including the upcoming EIS Continental-Divide-Creston Blue Gap project on the West side of Muddy Creek.

Salinity Sediment/Transport (BPS 41441): is an ongoing effort to address concerns in regard to sediment and salt loading within the Muddy Creek drainage, which eventually enters the Colorado River Basin. Data gathering and monitoring efforts are being conducted assessing water quality, flows associated with that water quality, and channel geomorphology. BLM is partnering with USGS to maintain and operate a streamgage at Baggs, WY (09258980) and entered an agreement with USGS to install, maintain, and operate another streamgage in upper Muddy Creek (see discussion below). Information collected will be used in modeling efforts using the Automated Geospatial Watershed Assessment toolkit (AGWA) and potentially NRCS models TR-55 and TR-20. These efforts will assist in both planning the road and pad construction to include methods and placement and also assist in analyzing existing surface disturbing activities (roads, pads, culverts, etc.) to assess sediment and salt transport in the Muddy Creek system.

Upper Muddy Creek streamgage: will include one annual continuous stream flow gaging station and one seasonal (Apr 1-Sep 30 minimum) continuous water temp and specific conductance monitor. It will provide stage and discharge data from the stream flow gaging station as well as seasonal water temp and specific conductance data. The following field parameters will be taken during on-site visits: barometric pressure, pH, specific conductance, water temperature, and dissolved oxygen. This new water quality protocol will mimic the current streamgage at lower muddy (09258980) in the water quality parameters taken: dissolved oxygen, pH, specific conductance, water temperature, hardness as $CaCO_3$, calcium, magnesium, potassium, Sodium Absorption Ratio, Sodium fraction of ions, Alkalinity, Chloride, Fluoride, Silica, Sulfate, water residue on evaporation, Aluminum, Arsenic, Barium, Beryllium, Iron, Manganese, Selenium, and TSS.

7. **WLCI Efforts**- The Wyoming Lands Conservation Initiative (WLCI) http://www.wlci.gov/ provided funding for several projects in the area that, while not focused on direct salt reductions, have the potential to reduce salt volumes by improving habitat and thus focus primarily on vegetation, which also benefits salinity. The most direct salinity related projects by WLCI this year focused on the reduction of Tamarisk (Salt cedar). The exact cost and salt savings of this effort are unknown at this time, but it is assumed that tamarisk reduction would have a positive effect on reducing salt production from the upper Colorado River Basin. Other projects this year included riparian vegetation plantings and fencing exclosures to protect riparian vegetation and streambanks from damage during grazing. These efforts help stabilize streambanks reducing erosion and further reducing salt erosion and transport.

8. **Culvert Assessment** – BLM is developing a protocol to assess culverts within the Atlantic Rim project area which is the majority of the Muddy Creek watershed. This assessment will identify and locate culverts that are undersized, mis-aligned, squashed, perched, buried, sediment laden, etc. within the watershed and in close proximity to both perennial and ephemeral streams. BLM will then work with compliance inspectors and operators to have problem culverts remedied and plan future road construction and culvert placement efforts. This is an ongoing effort and will have direct impacts to the amount of salt transport to streams.

9. **Reclamation Efforts** – The Rawlins Office has been working on reclamation standards and monitoring protocols to give to operators. Better and quicker reclamation of disturbed soils with desired vegetation will assist in retaining soils and hence reduce salt transport.

10. **RMP Implementation** – Under the new Rawlins Field Office RMP, APDs adjacent to streams are being analyzed differently. The RMP states that surface disturbing activities will be avoided in areas within 500 feet of perennial waters, springs, and wetlands and riparian areas. Also, areas within 100 feet of the inner gorge of ephemeral channels will be avoided. Exceptions have been made when certain circumstances have arisen. By following this approach, surface erosion is being prevented by avoidance of these highly susceptible areas. These evaluations are done primarily on CBM on-sites visits employing an interdisciplinary team approach to assess the proposed pad and road areas and address resource concerns. Benefits of this soil erosion prevention and minimization is difficult to document, but it is hoped that use of the AGWA modeling toolkit will enable their quantification.

11. **Engineered Drawings and Hydrologic Analyses Requests** – In difficult terrain where the topography is steep and multi-drainage systems exist, the BLM is requesting that roads/culverts in those areas be engineered and the hydrologic analyses done to properly size, locate, and number culverts. Alternative methods of road placement and construction are being explored especially in wildcat well areas where the production of CBM is unknown until drilling occurs. This should help minimize erosion and direct impacts to drainages and/or streams.

12. **Horizontal Directional Drilling (HDD) of Pipelines** – This is a relatively new endeavor where BLM is requesting pipelines crossing perennial streams be horizontally/directionally bored and not placed by the traditional trenching method which disrupts the channel geometry. This method is relatively new technology and has no impact on stream channels at all as the streambed, banks, floodplains, and riparian vegetation is left undisturbed. This will greatly assist in avoiding turbid situations in streams and preventing sediment transport from bed and bank disturbance while reducing/minimizing salt transport.

13. **Protocol for Erosion and Sediment Transport for Roads, Well Pads, and Pipelines** –Standards and protocols are being developed for construction of roads in regard to slopes, culvert size and placement; minimizing road widths; placement of more cross-culverts and wing ditches to distribute and reduce erosional forces; reducing well pad size, proximity to streams, and avoidance of steep slopes; and, minimizing right-of-way disturbance on pipelines. BLM has conducted educational tours that involved oil and gas operators, WY Game and Fish, and local Conservation Districts to demonstrate which BMPs and construction methods work and those that need to be improved. The majority of the salt transport is due to these surface disturbing activities and adequately assessing them and changing the way roads, pads, and other surface disturbing activities are planned, located, and constructed is key. This is an ongoing effort and should prove to be very effective as "on the ground" type work.

Rock Springs Field Office – WY 040

Point Sources

No point sources have been or are planned to be addressed in 2009.

Nonpoint Sources

The overall amount of disturbance in the upper reaches of the Colorado (Green) River Basin continues to increase as a result of energy development and population increases; however, the decrease in energy development has slowed the rate of new disturbance. State and federal regulations require erosion control and reclamation efforts on disturbances greater than one acre but given the time required for reclamation to be fully successful, the amount of disturbance continues to increase. Overall precipitation amounts have been lower than normal for approximately 10 years. In 2009, precipitation has been above average and spring patterns of precipitation and temperature have been prolonged and longer than normal. As a result, the potential for ground-water infiltration and vegetative growth has been greater this year than in recent years. This has resulted in a potential decrease in salt contributions from undisturbed lands and a potential short term increase from channel banks and disturbed sites. The higher levels of available water could also assist in reclamation success resulting in longer term reductions in sediment and salt production, but it is unknown how these levels compare with the potential increase resulting from higher flow energies.

The Wyoming Lands Conservation Initiative (WLCI) http://www.wlci.gov/ and Jonah Interagency Office (JIO) http://www.wy.blm.gov/jonah_office/ provided funding for several projects in the area that while not focused on direct salt reductions have the potential to reduce salt volumes by improving habitat and thus focus primarily on vegetation, which also benefits salinity. The most direct salinity related projects by WLCI this year focus on the reduction of Tamarisk (Salt cedar) http://en.wikipedia.org/wiki/Tamarisk the exact cost and salt savings of this effort are unknown at this time, but it is assumed that tamarisk reduction would have a positive effect on reducing salt production from the upper Colorado River.

A variety of activities occurred as part of normal activities in FY 2009 that had the secondary impact of reducing non-point erosion on public lands. Because of the nature of these activities and nature of monitoring, exact volumes of salt saved and the efficiency of each activity are general estimates. All the figures below are for the southwestern corner of Wyoming that covers the Rock Springs, Kemmerer, and Pinedale Field Offices. Some of these activities occurred outside the Colorado River Catchment, but the majority of the activity occurred within the area of interest.

The following assumptions were made for the calculations below:

A work month costs $4,500
Soil averages about 3% salt by weight for most soils in the area
The average bulk density of soil is 2.65 g/cc (165.4 lb/cu ft) (4,467 lb/cu yd)

1. **Road Maintenance** (Approximately the same as 2006, 2007, and 2008)
   350 miles of road maintained
   Assumptions
   2 cubic yard (cu yd) of soil are retained per mile of road maintained
   About 2 work months = $9,000

   - 350 miles * 2cu yd/mile * 4467 lb/cu yd * 0.03 lb salt/lb soil = 93807 lb salt = 47 tons of salt
   - Cost $9000/47 tons = $192/ton of salt

2. **Reservoir Repair**
   No reservoirs were repaired in 2009.

3. **Structures** (Same as 2006, 2007, and 2008) – No new grade-control structures were placed in streams during 2009. However, the structures mentioned in previous reports for this area are still operating and have not required any maintenance expenditures. Given that they are still preventing the upstream advancement of channel drops (headcuts), these structures could be considered to be highly cost efficient in preventing salinity contributions.

4. **Fire Rehabilitation** – Approximately 607 acres of land have been or are slated to be burned in 2009. Of this an estimated 400 acres are associated with a prescribed burn in late September. The remaining 207 acres were small wildfires ranging between 0.1 to 72 acres. Although providing an initial vulnerability to increased erosion, with proper vegetative recovery, fires can result in a longer term reduced erosive potential as compared to the pre-burn conditions. Soil and salt production will vary with precipitation and re-vegetation, the exact extent and cost of these salt savings is unknown at this time.

5. **Grazing Management** (Same as 2006, 2007, and 2008)
28,000 acres of land managed
Assumptions
3 cu ft of soil retained for each acre properly managed
Cost about 20 work months = $90,000 (Additional benefits to public lands also obtained)
This is a very rough estimate actual salt retention can change depending on weather events, soil type, or effectiveness of livestock management on a pasture basis, to name a few of the variables.

- 28,000 acres evaluated * 3 cu ft soil/ac * 165.4 lb soil/cu ft * 0.03 lb salt/lb soil = 416,808 lb of salt =208 tons of salt
- Cost $90,000/208 tons of salt = $432/ton of salt

5. **Oil and Gas Activity** - Much of the oil and gas development activity in the area is taking place in concentrated locations such as the Jonah and Pinedale Anticline Fields, but is not exclusive to those areas. Location in relation to water and land features that would assist salt and sediment transport are highly variable and are addressed by multiple Federal and State regulations.

SPECIFIC BASIN-WIDE PROJECT SUMMARIES

1. **Progressive soil surveys in 2009** – High resolution soil surveys are continuing on Public Lands in Wyoming's Upper Colorado River Basin. The salinity program funding allocated in FY 2009 was obligated in cooperative agreements with the Natural Resources Conservation Service in the Sublette and Lincoln Counties. These funds will support 3rd Order soil survey in Sublette County and the acquisition of large-scale LiDAR data to facilitate survey in Lincoln County. On the average, these funds will enable BLM to complete nearly 40,000 acres of soil survey. This soil survey and others in Uinta, Sweetwater, and Carbon Counties include correlated and digitized geospatial and tabular soil data sets with soil interpretations tailored to activities associated with oil and gas (O&G) development and livestock grazing uses. Use of these soil survey products is:

1) Improving the quality of soil resource impact analysis and mitigation prescription in the O&G development activities;

2) providing the O&G industry with planning and assessment tools that will allow companies to prepare better operational plans and Storm-water Pollution Prevention Plans (a Clean Water Act requirement) in less time and with lower costs; and,

3) providing critical input data for the tailoring of the Automated Geographic Watershed Assessment (AGWA) modeling toolkit for the upper Colorado Basin area. Application of this toolkit allows BLM

specialists to identify watersheds most vulnerable to surface disturbing actions and enables users to select the best management options to minimize erosion, runoff, and salt loading to waterways.

This spatial and tabular soils dataset will also be used to identify and protect fragile soil areas that, if disturbed, would impact water quality, aid in control of invasive plant species, select appropriate restoration strategies, and select appropriate management strategies. BLM, State regulatory agencies, O&G companies, and landowners will all benefit from the availability of high quality digital spatial and tabular soils data for their respective needs and applications.

2. **Automated Geographic Watershed Assessment (AGWA) modeling toolkit** – The BLM is undertaking a cooperative project with the University of Wyoming (UW), Wyoming Geographic Information Science Center (WyGISC) and the Department of Renewable Resources in support of improved management pertaining to energy development within the Upper Green (Colorado) River Basin for Wyoming. The long-term objective of this effort is to assist in predictive risk modeling of salt mobilization and transport using improved soil salinity mapping and modeling. BLM will continue working with the University Project Team to perform field research, parameterize existing functional hydrologic models, and to initiate the development of a mechanistic understanding of salt transport. As a first step in building a mechanistic model, the University Project Team will develop a salinity-loading screening tool that will function within the APD NEPA Analysis Toolkit to assist land managers in identifying areas where soils have a high salt content and a high susceptibility to erosion if disturbed. These efforts will be important foundational work for longer-term scientific and management improvements in understanding and managing for salt mobilization and transport, and provide immediate technical and scientific guidance to land managers who are tasked with better understanding linkages between coal bed methane and conventional oil and gas development and salinity loadings.

Regional salinity-control projects

Salt loading SPARROW model study: The USGS Utah Water Sciences Center (funded through BLM Washington D.C. National Monitoring Strategy program and through the Basin States fund) is in the last stage of completing their analysis and web publication of a regional model of the Upper Colorado River Basin that assesses the salt-loading, land disturbance impact from energy development (mainly energy field roads and well pads).

Phenological plant stage prediction in the Upper Colorado River Basin: It may be possible to predict phonological plant stages (green up) by determining whether an area is above or below a 30-yr temperature average. The objective is to provide a web-tool to the range conservationist and the public that can be used during the growing season to forecast green up on the range. BLM is working with the University of Utah and Utah State University to combine remote-sensing technology and climate information to produce short-term (7-14 day) forecasts of the phonological plant stages of grasses and forbs on rangeland in the UCRB. This project relates back to our fundamental goal to protect the resource base, which is minimization of soil erosion by understanding and monitoring the vegetation cover and growth patterns throughout the year. During FY 2009 a meta-database (compendium) of all available pertinent studies to date was put on the web. Also, another graduate student has joined the project and is beginning to create the software code to house the model and process raw satellite data. BLM joined with a number of other agencies (USGS, Ames Research Center, and others) to write a grant proposal to NASA to further expand our work and join other agencies working in the same geographical area on similar endeavors. We were not successful in capturing the funding; however, it forged new relationships, sparked new ideas for further collaboration and work, and started the search for other funding to carry out some of the new ideas.

FIGURE 17 BLM 1010 SALINITY PROGRAM - FY 2009 ANNUAL REPORT FOR IMPLEMENTATION PROJECTS

1. RESOURCE AREA (FIELD OFFICE USUALLY)	2. CONTACT NAME	3. WATER SHED	4. TYPE PROJECT	5. VOLUME DISCHARGE (WELL, GALLONS PER DAY)	6. LANDSCAPE POSITION	7. SOIL DEPTH AFFECTED (TENTHS OF A FOOT)	8. ACRES TREATED	9. ELECTRICAL CONDUCTIVITY OF SOIL PASTE OR WELL WATER (MICRO-SIEMENS/CM)	10. ESTIMATED SALT YIELD FROM COL. 5 AND 9 (TONS OF SALT PER YEAR FROM WELLS)	11. ESTIMATED SALT YIELD FROM COL. 7, 8, AND 9 (TONS OF SALT PER YEAR FROM SOIL)	12. EROSION FACTOR (TONS/ ACRE)	13. SALT FACTOR (decimal fraction for % SALT IN SOIL)	14. ESTIMATED SALT YIELD FROM COL. 8, 12, AND 13 (TONS OF SALT PER YEAR)	15. TOTAL SALT YIELD (TONS, LIFE OF PROJECT)	16. SALINITY PROJECT COST (DOLLARS PER YEAR)	17. TOTAL COST (DOLLARS PER YEAR)
AZ Ft. Pierce	R. Smith	15010009	Rock Cross		pediment	1.00	13800.00				1.00	0.030	**414.00**	8280.00	$50,000.00	$50,000.00
NM Farmingt	B. Wegener	14080101	sage control - 8 sites		mesa	1.00	12661.00	2920.00		**35698.35**				35698.35	$0.00	$162,616.42
NM Farmingt	B. Wegener	14080106	sage control - 2 sites		mesa & val	1.00	5307.00	3260.00		**16705.67**				167056.70	$18,835.05	$71,391.90
NM Farmingt	B. Wegener	14080103	sage control - 8 sites		mesa & val	1.00	1909.00	4550.00		**8387.15**				83871.50	$16,164.95	$16,299.00
NM Farmingt	B. Wegener	14080105	sage control - 1 site		mesa	1.00	574.00	2500.00		**1385.64**				13856.40	$0.00	$9,763.88
UT MFO	Ann Marie A	various thro	Trail closures/OHV manage		various, ge	0.40	20.00				5.00	0.040	**4.00**	40.00	$30,000.00	$30,000.00
UT VFO	Tim Fairclot	Pariette We	various: water sampling, cu		wetlands	0.20	200.00				5.00	0.020	**20.00**	200.00	$40,000.00	$100,000.00
UT all	Lisa Bryant/	UPCD & H	Watershed Improvements/s		Primarily u	0.40	19000.00				5.00	0.015	**1425.00**	14250.00	$0.00	$1,000,000.00
Ongoing projects:																
AZ Statewide	J. Renthal	various	various										**1791.00**			
UT Hanksville	P. Zieg	Caineville v	plug 2 wells	1938816.00	dry wash			2400.00	**5033.66**							$120,000.00
UT GSENM	M. Turaski	Sheep Cr.	Dike repair/reseeding		Floodplain terraces		5120.00				6.60	0.030	**1013.76**		$54,000.00	$128,000.00

Estimated total: 71,878.23 tons/yr

NOTES:

Columns 10, 11 and 14 are essentially the same. However, depending on what information you have, "tons of salt per year" can be derived 2 ways. Column 10 and 11 use the electrical conductance of soil paste or water to determine tons of salt per year. Column 14 uses information that may be found in published literature. Formulas have been written for columns 10, 11 and 14. So for instance, if you enter information in columns 7, 8, and 9, a quantity should appear in column 11 (in this case, no information would be entered in 5, 12, and 13 and no quantities would appear in columns 10 and 14).

A mid-range coefficient of 0.71 is used in the formula for columns 10 and 11 to convert EC to TDS (mg/L or mg/Kg). Published literature commonly states that TDS is 56 to 85% of EC.

3. Watershed: Enter 8, 10, or 12 digit hydrologic unit code (4, 5, or 6th level HUCs).
4. Type Project: Identify the type of project, e.g., saline well plugging, road construction/reclamation, disk plowing and seeding, brush beating, tamarisk removal, contour furrowing, spreader dike, etc.
5. Volume Discharge: Enter the gallons per day discharge of a saline artesian well. Make sure you also enter an electrical conductance for column 9, if you have that information.
6. Landscape Position: Document the position of projects other than well pluggings, e.g., steep side slope, alluvial fan, valley bottom, floodplain, etc.
7. Soil Depth Affected: Enter the depth of the soil affected in tenths of a foot (i.e., 18 inches = 1.5 ft) for road construction/reclamation, disk plowing and seeding, brush beating, prescribed burn, etc.
8. Acres Treated: Enter the number of acres treated or affected by the project, e.g., acres plowed, reseeded, or acres of headcutting controlled.
9. Electrical Conductivity of Soil Paste or Well Water in micro-Siemens per centimeter: If data exist for ECs of soil or water, enter the value here.
10. Estimated Salt Yield from Columns 5 and 9 (tons of salt per year from wells): This is a calculated quantity for salt yield from water for values entered in columns 5 and 9.
11. Estimated Salt Yield from Columns 7, 8, and 9 (tons of salt per year from soil): Same as column 10, only this is for soil.
12. Erosion Factor (tons/acre): Enter the tons of soil erosion controlled per acre treated, e.g., determined using PSIAC method, soil erosion curves or other published information.
13. Salt Factor (% salt in soil): To calculate actual % salt in soil, the total mass of the salt ions must be mathematically calculated and then divided by the total mass of all ions and multiplied by 100.
So, unless you can obtain this information from published literature, it may be difficult to calculate. Example: 1.2% salinity should be entered as 0.012
14. Estimated Salt Yield from Columns 8, 12, and 13 (tons of salt per year): Similar to columns 10 and 11, only this salt yield relies on published data (e.g., soil survey information, university studies, etc.).
15. Total Salt Yield (tons, life of project): Multiply the annual estimated tons of salt yield by the number of years of expected life of the project. Then, enter that number in this column.
16. Salinity Project Cost (dollars per year): Enter costs of 1010 salinity subactivity funding for the project.
17. Total Cost (dollars per year): Total funding from all subactivities (e.g., 1010 Salinity + 1020 Range, 1040 Riparian, 1220 Recreational, 1310 Oil and Gas, etc.).

Disclaimer: It should be noted that the estimated salt yields are potential and not necessarily actual. Actual salt loading from public lands depends on various factors such as: amount of precipitation, soil composition and texture, slope, percent of vegetation, etc.

Table 4 – BLM Salt Retention Estimates for Fiscal Years 2006 – 2009

Project Category	SALT RETAINED IN TONS/YEAR[1]			
	FY 2006	FY 2007	FY 2008	FY 2009
POINT SOURCE[2]	14,600	14,600	14,600	14,600
NONPOINT SOURCE[3]	3,300	26,000	81,900	71,900
ALL PROJECTS	17,900	40,600	96,500	86,500

[1]Rounded to the nearest 100 tons.

[2]BLM's Report to Congress through the year 2002, plus the 2-plugged wells in Utah.

[3]Amount that could be estimated, i.e., this is possibly a minimum.

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Bureau of Reclamation
Colorado River Basin Salinity Control Program
Accomplishments for Fiscal Year 2009

Salinity Modeling Studies

Colorado River Simulation System (CRSS)

In FY 2009, the Salinity Control Forum did not require any salinity modeling studies to be completed with CRSS. Modeling runs in support of the 2011 Triennial Review will begin in FY 2010. Though CRSS salinity modeling was not required, the following tasks were completed to improve our understanding of CRSS results and maintain model inputs for future studies.

During FY 2009, Reclamation quantified the impacts to salinity concentration and economic damages at the three numeric criteria locations in the Lower Colorado River basin as if no salinity control program had been implemented. A spreadsheet analysis quantified the annual increase in salinity concentration had no salinity control program been in place from 1980-2007. The annual salinity concentration increase found in 2005 was then used in an economic analysis to determine the additional salinity damage costs that would have been incurred as a result of not implementing the salinity control program. (The salinity damage costs are discussed in the following Economic Impacts Model section) These data can be used in upcoming cost/benefit analysis that may be included with the 2011 Triennial Review.

The salinity removed by water quality improvement projects was updated in August 2009 to account for modifications and extension of salinity control levels provided by both the NRCS and BLM as published in the 2008 FAR. Historic salinity control levels are presently available from 1980-2008. The CRSS salinity model will be updated to incorporate these data for future studies.

Natural flow and salt data were extended through Calendar Year (CY) 2007 in the Upper and Lower Colorado River Basin. The natural flow and salt web pages (www.usbr.gov/lc/region/g4000/NaturalFlow/index.html) are available through Reclamation's Upper and Lower Colorado region's websites. These web pages provide current and previous version of natural flow and salt data for download and review.

Economic Impacts Model

In FY 09, a series of model runs were conducted for the Science Team to estimate damages based on 2005 historical salinity concentration levels. Using the 2005 Salinity Damage model, salinity damage estimates were made using historical concentrations based on with and without salinity control projects. Without salinity control project conditions, salinity levels are higher (856 TDS at Imperial) and the damages are greater ($616 million annually). With the implementation of salinity control projects, the TDS level is 710 mg/l at Imperial and the damages are approximately $353 million annually. By implementation of the program it reduced the historical concentrations by 146 mg/l and had an annual economic benefit of approximately $263 million.

To calculate the dollar per ton of salt damage and the per ton benefit value, 10,000 tons per mg/l is used. Further analysis was conducted over the historic period based on the average tons per mg/l and the results of this analysis impacted the dollar value per ton of salt estimate. Based on a 30 year period, the average was about 10,000 tons per mg/l. This average included some years that had high amount of tons that brought the tons per mg/l value up. If a more recent 20 year average is used the tons per mg/l average is

8,229 tons of salt. The result is that using the 10,000 tons per mg/l derives an annual benefit of approximately $180 per ton of salt removed. If the 8,229 estimate is used to calculate the annual benefit per ton of salt removed, the average value is approximately $219 per ton. It has been suggested that the per ton dollar value be based on the most recent 20 year data.

It should be noted that these estimates are based on what has only been identified in the Salinity Damage Model to date. There are salinity related costs that have not been included in the current model such as irrigation management costs attributed to high salinity levels. Research may further clarify the costs and benefits that are attributable to the salinity control program. Please see the next section and the section **Identification of Unquantified Damages** for additional discussion.

Estimation of Salinity Agricultural Damages in Downstream Areas

The effects of increasing Colorado River salinity on downstream agricultural areas in Arizona, California, and parts of Nevada have been estimated in order to determine the benefits of upstream salinity control measures. Since much of the agricultural damages have occurred in California's Imperial Valley, the damage estimation procedures are mostly tailored to evaluate damages in that area.

A non-linear optimization model was developed using crop yield damage functions. The damage functions predict changes in the expected yield of crops under varying salinity levels. The model is useful for depicting general trends that might be expected in agricultural production.

Collection of on-farm data about cultural practices to mitigate the effects of salinity are continuing. A site trip to collect data and consult with local area extension personnel in the Imperial Valley is set for the last week of September, 2009. During the site visit, the Multi-State Salinity Coalition conference in Indian Wells, CA will be attended. The purpose of attending the conference is to obtain contacts with people who are familiar with farming practices and the effects of salinity on crop yields in the Imperial Valley. Discussions will focus on how farmers manage their operations in view of irrigating with saline water and how that impacts the profitability of farms. The discussions will attempt to discern the monetary and non-monetary impacts of managing saline irrigation on prominent crops in the Imperial Valley. The non-monetary impacts will include management costs. Monetary costs will include cultural practices that minimize, to the extent possible, the yield effects of irrigating with saline water.

Identification of Unquantified Damages

The Work Group established a subcommittee to work with Reclamation to address unquantified damages. The subcommittee prepared a list of salinity damages that are currently not identified or estimated in the salinity damage model. This list is made up of three categories. These categories are (1) Reasonable Effort to Quantify; (2) Considerable Effort to Quantify; and (3) Cannot be Quantified but described qualitatively.

Efforts have begun to address some of the issues related to the first category. Specifically, Reclamation contracted for a research study on the relationship of salinity to turf at golf courses that use Colorado River water. For FY 2009, a contract was established for a preliminary research (Phase I) on the potential damages from salinity on golf course turf grasses. A report has been prepared on the results of this preliminary research and is currently being reviewed.

Science Team

To further improve and expand our knowledge of methods and data used to model salinity within the Colorado River basin, the Salinity Science Team was created. This team incorporates technical experts and coordinators from each Federal agency (Reclamation, USDA, NRCS, BLM, and the USGS) that provides salinity data and/or modeling. For more information on the Science Team, please refer to the last section of the USGS Chapter in the 2006 FAR.

The following are some of the topics that were addressed by the Science Team during meetings held about once a quarter in FY-2009:

1. Tamarisk control
2. Historic concentrations below Hoover, Parker, and Imperial
3. Economic Damages update
4. Desert Lakes Monitoring (located below Huntington Cleveland Project – Emery County, UT)
5. SPARROW model updates and user tools
6. Impacts of energy development on soil and water resources
7. Report on the Hoover salinity discrepancy study
8. Gunnison Basin selenium management program and salinity control activities
9. Saline/drought-tolerant plant species
10. Reports on awarded Special Projects
11. Review of proposals for Special Project funding and recommending to the Work Group which proposals should receive funding.

Basinwide Salinity Control Program (Basinwide Program)

American Recovery and Reinvestment Act of 2009, P.L. 111-5, February 17, 2009 (ARRA)

The purposes of the ARRA are, among others, to quickly and prudently commence activities that preserve and create jobs promoting economic recovery and to invest in infrastructure providing long-term economic benefits.

Reclamation's Upper Colorado Region solicited applications for reducing salinity contributions to the Colorado River through a Funding Opportunity Announcement (FOA) announced on March 31, 2009 and closed on May 14, 2009. Applications were evaluated and ranked by an Application Review Committee with representatives from the Colorado River Basin States and Reclamation. Reclamation awarded grants totaling more than $11.1 million in ARRA funds and $4.8 million in cost share funds from the Basin Funds to the following irrigation companies in Colorado, Utah, and Wyoming. These projects when constructed will help control nearly 12,000 tons of salt loading.

Entity	Project Description	Cost	Tons of Salt Control
Huntington Cleveland Irrigation Company, Emery County, UT	Construct 5.1 miles of 30" and 60" pipe, 3 pressure reducing stations, and 2 connections to existing regulating ponds. Abandon 9.1 miles of canal and provide an alternate means to deliver winter livestock water in an additional 20.1 miles of canal.	$ 2,902,538	3,156
Eden Valley Irrigation and Drainage District Eden/Farson WY	Replace earth-lined laterals with pipe in a pressurized pipeline network system. Replace approximately 8,324 feet of canal with 8"-18" HDPE DR 32.5 pipe. Convert 2,450 feet of an existing earth-lined lateral to a drainage lateral to drain the system in the fall.	$ 545,120	407
Red Cap Lake Fork Irrigation Company Duchesne, UT	Replace 3.87 miles of the Red Cap Canal and 6.87 miles of laterals with a 10.16 miles pipeline conveyance system.	$ 2,544,257	1,817
Peoples Canal Company, Manila, UT	Construct two settling basins and a screening structure at the canal diversion on the Henry's Fork River. Replace the canal from the settling basin to the last user - 9.1 miles down the existing canal right of way.	$ 7,160,520	5,553
Montezuma Valley Irrigation Company, Cortez, CO	Pipe approximately 25,512 linear feet of the lower reaches of the Lone Pine Canal with pipe ranging in size from 26" to 36" HDPE pipe. The head pressure developed in this gravity pipe will also be utilized for existing and future on-farm sprinkler improvements.	$ 2,173,268	953
	Administrative Costs	$ 500,000	
		$15,825,703	11,886

Table 5 – ARRA Funding

ARRA funding must be obligated by Sept. 30, 2010, and the projects must meet specific milestones and timetables or their funding could be reconsidered. Before implementation, the projects must also meet specific requirements such as demonstrating compliance with the National Environmental Policy Act and other environmental laws.

Price – San Rafael River Basins, Utah

Huntington Cleveland Irrigation Company (HCIC) Project: The Project is located in northern Emery County, in and around the towns of Huntington, Lawrence, Cleveland, and Elmo. The Project was selected in the 2004 Request for Proposals (RFP) and awarded a cooperative agreement in September 2004. A new cooperative agreement was executed in November 2006 and was modified again in September 2009. Approximately 350 miles of open earthen canals and laterals are being replaced with a pressurized pipeline distribution system (Distribution System) to accommodate sprinkler irrigation on about 16,000 acres. Funding for this project is being shared between Reclamation's Basinwide Program, HCIC, NRCS's EQIP, the Parallel Program, and Rocky Mountain Power, formally known as Utah Power and Light. The last of Reclamation's share of $17,116,336 for the Off-farm Distribution System was obligated in 2008. Beginning in 2009 Reclamation shall provide up to an additional $6,000,000 equally

50/50 with HCIC funds for completion of the Distribution System. About 80% of the Off-farm Distribution System is installed and about 60% of the On-farm Distribution System in installed. The Project, scheduled to be completed in 2012 will result in the annual reduction of 59,000 reportable tons of salt in the Colorado River at an anticipated cost of approximately $46/ton. Of the 59,000 tons of salt, 13,000 are attributed to the Off-Farm Distribution System and 46,000 tons are attributed to the On-Farm Distribution System and the on-farm salinity control measures (sprinklers).

Carbon Canal, Butcher Lateral Salinity Reduction Project: The $1,998,330 Butcher Lateral Salinity Control Project is located in Carbon and Emery Counties, southeast of Price, Utah. It was selected from the applications received in the 2008 FOA. A Cooperative Agreement was executed in September of 2008 and construction was complete in May of 2009. This project replaced approximately 73,300 feet of earthen laterals with 45,000 feet of pressurized irrigation pipe resulting in the annual reduction of 1,354 reportable tons of salt in the Colorado River. It is expected that the pressurized pipeline will induce on-farm improvements resulting in the annual reduction of an additional 2,058 reportable tons of salt. It is anticipated that the project will result in the total annual reduction of 3,412 reportable tons of salt in the Colorado River at an anticipated cost of approximately $48.85 per ton of salt.

Big Sandy Project, Wyoming

Eden Valley, Farson/Eden Pipeline Project: The Farson/Eden Pipeline Project is located in Sweetwater County, in the vicinity of Farson, Wyoming. It was selected from the applications received in the 2008 FOA. A Cooperative Agreement was executed in February of 2009 for the amount of $6,453,072. This project will replace approximately 24 miles of earthen laterals with irrigation pipe resulting in the annual reduction of 6,594 reportable tons of salt in the Colorado River at an anticipated cost of approximately $52.57 per ton of salt.

Uintah Basin, Utah

Moffat-Ouray Pipeline Salinity Project, Gusher, Utah: A $1,700,000 modification was incorporated into the Moffat-Ouray Pipeline Salinity Project cooperative agreement in September 2008 to fund an approved application received in the 2008 FOA to connect a pipeline to Brough reservoir. This connection allows storage water carriage through the pipeline instead of the Ouray Valley Canal. This enables the company to keep the Ouray Valley Canal dry for eleven months of the year resulting in the annual reduction of an additional 3,119 reportable tons of salt at a cost of $29.28 per ton.

Steinaker Ditch Salinity Reduction Project: The $135,000 Steinaker Ditch Salinity Control Project is located in Uintah County, north of Vernal, Utah. It was selected from the applications received in the 2008 FOA. A Cooperative Agreement was executed in February of 2009. This project will replace approximately 3.2 miles of earthen ditch with 1.7 miles of irrigation pipe. It is anticipated that the project will result in the total annual reduction of 130 reportable tons of salt in the Colorado River at an anticipated cost of approximately $55.79 per ton of salt.

Gunnison Basin, Colorado

Uncompahgre Valley Water Users Association (UVWUA) Phase 3 Project: In FY 09, the UVWUA continued construction of Phase 3 of their East Side Laterals (ESL) project which involves the piping of 10.5 miles of laterals under the South and Selig Canal systems and the reduction of about 2,300 tons of salt loading annually. This phase is utilizing $1.3 million of salinity-control funding as well as funding from the Reclamation's Departmental Irrigation Drainage (selenium) Program. Construction of Phase 3 is slated to be completed by 2011.

UVWUA Phase 4 Project: Additionally, as a result of the 2008 Basinwide Program FOA, the UVWUA was awarded another cooperative agreement for Phase 4 of the ESL in December 2008. This phase involves an additional 11 miles of laterals under the Selig and East Canal systems and the reduction of about 3,700 tons of salt loading annually. Approximately $2 million of salinity-control funding will be supplemented with approximately $800,000 from a Section 319 grant obtained through the Colorado Division of Public Health and Environment. Construction of one short lateral was completed in FY 09; the remaining portions of Phase 4 are slated to be completed by 2012.

Grandview Canal and Irrigation Company Project: This project that was awarded from the 2008 FOA, involves piping a portion of the Grandview Canal and several laterals in an area tributary to the North Fork of the Gunnison River near Crawford in Delta County. In July 2009, Reclamation entered into an agreement to provide $5.3 million to pipe 4.8 miles of main canal and 5 miles of laterals and convert about 900 acres of currently flood-irrigated farmland to sprinkler irrigation. The project should be completed by late 2011 and is expected to reduce salt loading by 6,400 tons/year.

Grand Valley, Colorado

Grand Valley Irrigation Company (GVIC) Project: As a result of selection under the 2008 Basinwide Program FOA, the GVIC was awarded a $3 million cooperative agreement to line about 2.9 miles of their main canal within the city of Grand Junction. A salt loading reduction of approximately 4,500 tons annually is expected. The canal lining will consist of a PVC membrane with a shotcrete cover. Construction began in November 2008 and is expected to be completed in 2011.

San Juan River Basin, New Mexico

San Juan River Demonstration Project: The San Juan River Dineh Water Users, Inc. operates the Hogback and Fruitland irrigation projects located on both sides of the San Juan River near Shiprock, NM. The projects consist of about 50 miles of lined main canals and over 250 miles of unlined laterals that provide water to about 13,000 acres of irrigated land. The average irrigated parcel size is about 13 acres. This $194,000 demonstration project would replace about a lateral about 7,900 feet long with an approximately 2 acre settling pond and about 5,000 feet of PVC pipe. The estimated salt savings for this activity is about 199 tons/year and the project will be completed in 2011. The purpose of the demonstration is to determine if the NRCS EQIP can be successfully implemented on the Navajo Reservation. This lateral provides water to about 167 acres of irrigated land consisting of 12 separate parcels. Successful implementation of land leveling and installation of gated pipe would result in an estimated salt savings of 384 tons/year. Combined cost effectiveness of this project is about $43/ton.

Paradox Valley Unit, Colorado

This project intercepts extremely saline brine (260,000 mg/l total dissolved solids) before it reaches the Dolores River and disposes of the brine by deep well injection (injection interval about 14,000 feet below ground surface). Seismicity associated with the injection process has diminished since the injection rate reduction in FY-2000 and remains at a very low frequency and magnitude.

The project continues to intercept and dispose of 100,000+ tons of salt annually, but the pressure necessary to inject the brine into the disposal formation at 14,000 feet is increasing. Modification of the current facility to operate at a higher injection pressure to extend the life of the current injection well is scheduled for 2009. Reclamation has also initiated a Plan of Study to investigate the feasibility of other salt removal alternatives to augment the project, including a second injection well. As part of the Plan of

Study, an investigation of alternative salinity control methods was completed in June, 2008. The results of the investigation indicated a need for a current characterization of the regional groundwater flow to determine the appropriate strategy for future salinity control efforts. An interagency agreement was initiated with the USGS to conduct a hydrogeologic study and investigations for Phase I of the study began in the second quarter of FY 09. The objective of Phase I is to develop preliminary flow models to evaluate conceptual models of groundwater flow in the stream-aquifer system in the Paradox Valley. The need to proceed to Phase II of the study will be dependent on the results of Phase I. If the Phase I results are inconclusive and indicate a need for additional information, Phase II of the study will be implemented.

Table 6 – Paradox Well Injection Evaluation

Injection Period	Operational Days[1]	Pressure Start	Pressure End	Pressure Increase	Tons of Salt Injected[2]	No. of Induced Seismic Events	Maximum Magnitude of Induced Seismic Events	Estimated Tons of Salt Entering the River[3]
Jan-May '02[4]	148	1609	4432	2823	52,860	25	2.9	9,234
June-Dec '02[5]	178	929	4593	3664	58,953	34	2.2	9,744
Jan-May '03[5]	144	1172	4627	3455	53,173	27	2.1	18,560
June-Dec '03[5]	184	1154	4675	3521	59,530	106	2.3	9,430
Jan-May '04[6]	140	1201	4640	3439	51,449	47	2.4	20,125
June-Dec '04[7]	160	1091	4541	3450	51,589	57	3.9	7,548
Jan-May '05[5]	140	1038	4736	3698	55,024	69	2.4	13,728
June-Dec '05[8]	148	1203	4750	3547	46,551	31	2.6	35,739
Jan-June '06[9]	138	375	4680	4305	44,779	10[10]	2.4	50,050
July-Dec '06[5]	162	1084	4797	3713	56,920	13[10]	2.1	20,566
Jan-June '07[5]	159	1066	4796	3730	56,006	7[10]	1.1	21,658
July-Dec '07[5]	163	1232	4712	3480	57,395	31	2.6	12,378
Jan-June '08[11]	160	1152	4813	3661	54,720	47	1.3	16,237
July-Dec '08[5]	162	1263	4822	3559	56,734	61	2.1	15,845
*Jan-Mar '09[5]	84	1246	4756	3510	29163	20	2.6	18,742
Apr-Sept '09[12]	160	1157	4891	3734	55,083	70	2.7	16,838

1 Operational days include partial days of operation which accounts for variations in tons of salt injected

2 Tons of salt injected based on 260,000 mg/L. Brine concentration varies slightly due to seasonal and environmental fluctuations.

3 Tons of salt entering the river based on regression equations developed by Don Chafin, USGS Report #02-4275.

4 Begin 100% brine injection

5 No problems

6 Down from 3/1/04 through 3/7/04 for mechanical problems

7 Implemented quarterly 10-day shutdown schedule from 9/22 to 10/22; M3.9 earthquake on 11/7; plant shut down until 11/18; discontinued 10-day shutdown schedule

8 Down from 11/13/05 through 12/31/05 for mechanical problems

9 Down from 1/1/06 through 1/19/06 and 2/16/06 through 3/2/06 for mechanical problems

10 Seismic data for 2006 and the first half of 2007 is likely incomplete due to seismic network problems

10 Seismic data for 2006 and the first half of 2007 is likely incomplete due to seismic network problems

10 Seismic data for 2006 and the first half of 2007 is likely incomplete due to seismic network problems

11 Down from 4/16-17/08 for mechanical problems

12 Down from 5/18-19/09 for mechanical problems

* Biannual shutdown schedule changed from winter/summer to spring/fall

Parallel Program

Section 205 of the Act authorizes Reclamation to expend amounts from the Basin Funds to repay the Treasury the reimbursable cost allocation of salinity projects or provide a cost share amount. This includes appropriations expended by the NRCS in their salinity program. The NRCS has questioned its ability to accept Basin Funds for cost sharing directly into its salinity program. Rather than repay the Treasury, the Colorado River Basin States (Basin States), NRCS, and Reclamation developed a "Parallel Program." Cost share funds from the Basin Funds have been used to accelerate and supplement implementation of the NRCS salinity measures by funding – through state agencies in Colorado, Utah, and Wyoming – salinity control measures that are separate, but parallel to, the salinity control measures implemented by the NRCS. Reclamation, with recommendations from the Basin States, had interpreted the Act to allow funds from the Basin Funds to be expended in the Parallel Program to further the general purposes of the Act.

Utah Department of Agriculture and Food (UDAF)

Significant changes occurred in UDAF management of Parallel Program funds used for salinity control in 2009. Through negotiations with NRCS, UDAF was able to obtain funding ($300,000 NRCS's basin states cost share funding for technical assistance) to hire an assistant program manager in salinity and contract for two salinity planners through the Utah Association of Conservation Districts. These positions have been filled and are contributing to Utah's salinity control efforts. UDAF is also using some of those funds to develop a web based planning, data collection, and grant/contract management tool. It is anticipated that this tool will start being used by UDAF and contracted employees the summer or fall of 2010.

During the 2008 -2009 federal fiscal year UDAF has received $908,207 for on-the-ground salinity control. NRCS provided one contract for $100,358 and Reclamation one contract for $22,866 during this season. Through the use of technical service providers and contracted planners UDAF was able to obligate $741,906 with three producers and a local Conservation District with the majority of the funds going into sprinkler systems in the Manila salinity area. The average amortized cost per ton for all contracts was $66. UDAF was able to obligate $865,130 during 2008 -2009 fiscal year. The following table summarizes the contracts.

Entity	Location	Project Type	$ Amount	$/Ton
James Allred	Emery County	Sprinkler Irrigation System	$100,358	$64
EWCD	Emery County	Data Collection / Monitoring	$22,866	N/A
San Rafael CD	Emery County	Irrigation Monitoring	$25,000	$17
Bob Slagowski	Daggett County	Sprinkler Irrigation System	$62,580	$67
George Olson	Daggett County	Sprinkler Irrigation System	$301,584	$63
JRB	Daggett County	Sprinkler Irrigation System	$352,742	$59

Table 7 – List of Contracts

UDAF is also undertaking a salinity range project on around 500 acres in Muddy Creek drainage. This project was recommended by the Forum's Workgroup to be funded with "Special Project" funds for the purpose of quantifying salinity control and costs associated with such control. Several surface practices will be used to retain salts and measurements made to quantify retained salts for each practice. The project is a cooperative effort with a local rancher in Emery County.

Colorado State Conservation Board (CSCB)

The CSCB receives Parallel Program funding based upon a contract with Reclamation. The Parallel Program in Colorado is delivered by six local conservation districts that subtend the boundaries of the

NRCS EQIP-approved salinity control areas of Silt, Grand Valley, Lower Gunnison, McElmo, and Mancos salinity areas. These districts receive funds from the CSCB. The districts enter into written contractual agreements with individual landowners and entities for the installation of approved salinity control projects and/or wildlife replacement projects that lie within salinity control area boundaries. The projects are planned, designed, and certified by NRCS or district employees paid with Parallel Program funds. All projects are planned, designed, and certified based upon current NRCS Standards and specifications. Each participant signs an operation and maintenance agreement in effect for the life of the irrigation improvements installed. The CSCB generally follows NRCS EQIP planning and contracting procedures in place. Parallel Program funds are utilized:

- To fund projects that do not meet all EQIP eligibility requirements
- To fund projects such as group or off-farm entities that are not eligible or too complex to be implemented through EQIP
- To fund projects when there are insufficient funds available through EQIP.

The projects are planned and contracted using the current NRCS payment schedule. Applications are received on a continuous basis, and are selected for funding as current year funding is made available from Reclamation. The applications are screened and prepared by the NRCS.

Applications are funded by district in order of the best cost effectiveness. All applications meeting NRCS planning standards that result in an annualized cost per ton of less than $60 are considered for funding depending upon funds available. The cost effectiveness and salt loading data used for these calculations are standardized for all salinity control areas in the State of Colorado by the NRCS. The local conservation district recommends and refers the application for approval to the Colorado Parallel Program coordinator. Upon approval of the application, the district enters into a contract with the applicant for the irrigation and/or wildlife improvements based on the current NRCS payment rate. The State of Colorado then encumbers those funds. Upon completion of the project, the NRCS certifies the installation, and the district provides a payment to the landowner or entity.

Progress: 212 contracts have been written for participants to date. This represents a total financial assistance obligation of $10,536,833. 128 participants have installed salinity control measures to date on 6,486 acres of irrigated land, resulting in 14,747 tons of salt reduction. Financial assistance payments of $7,367,759.00 were made to these participants for these improvements. The installations include the following:

- 1,814 acres of sprinklers
- 4,580 acres of improved surface irrigation systems (underground to gated pipeline, etc.)
- 92 acres of drip irrigation systems

The average annual cost/ton for these improvements is $48.51.

Eleven wildlife contracts have been completed improving and/or replacing 318.8 acres of wildlife for a financial assistance cost of $289,754.

Plateau Valley Pilot Project: The Plateau Valley Pilot Project (PVPP) began in 2009 to provide progressive incentives for salinity control proportional to the value of benefits derived, and identify and quantify acres of irrigation improvements that may be credited to NRCS salinity control activities as a result of the implementation of general EQIP funding in the Plateau Valley Pilot Project area. $300,000 in funding has been reserved for the PVPP in the contract between Reclamation and the CSCB. The CSCB has a contract agreement in place with the DeBeque-Plateau Valley Conservation District to deliver these funds. The NRCS provides technical planning, design, and construction inspection assistance for planned practices, and develops conservation plans for applicants in the Plateau Valley

Pilot project area. The NRCS develops general EQIP program contracts with applicants in the target area. The contracts include an Operation and Maintenance provision, and payment for basic Irrigation Water Management or an enhanced Irrigation Water Management level at the option of the participant. For 2009, five applications were received totaling $14,179 and serving 144 acres.

Basin States Program

To clarify authority for the administration of the Parallel Program, the Basin States prepared and put forth legislation through then-Senator Salazar's office into the 2008 Farm Bill to amend the Act that has now created the Basin States Program (BSP). Public Law 110-246 amended the Act and established the BSP. The BSP is to be implemented by the Secretary through Reclamation. Amounts from the Basin Funds used for cost sharing, not just those associated with the NRCS salinity program, will now be administered through the BSP. Reclamation supported the legislation and is pleased to have clear authority for the type of activities and projects formerly funded by the Parallel Program.

The Act requires a planning report to be submitted to Congress 30 days before Reclamation implements the BSP. Reclamation, with input from the Advisory Council, prepared a draft Planning Report. The final Planning Report sent by the Secretary, was received by Congress on Monday, September 14, 2009. The Planning Report has now sat before Congress the required 30 days and Reclamation has begun discussions with the Basin States to begin implementing the BSP.

The Parallel Program has been extended through March 31, 2010, to allow time to implement the BSP.

Summary Data
Colorado River Basin Salinity Control Program

The following tables are summaries of the Federal Salinity Control Programs.

COLORADO RIVER BASIN SALINITY CONTROL PROGRAM TITLE II

Actual Appropriations and Payments from the Basin Funds 1996 thru 2009

October 21, 2009

TOTAL PROGRAM ($1,000)

Unit	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Subtotal	2010	2011	2012	2013
Grand Valley O&M	0	0	3,755	908	1,397	646	1,293	1,128	961	700	1,491	1,340	1,228	1,761	16,608	1,889	1,889	1,889	1,889
Paradox Valley O&M	0	0	1,375	2,432	3,911	2,016	2,685	2,123	2,461	2,019	2,415	2,668	3,212	3,119	30,436	2,932	2,932	2,932	2,932
Lower Gunnison O&M	0	0	401	456	598	331	321	0	0	0	0	0	0	0	2,107	0	0	0	0
McElmo Creek (Dolores) O&M	0	0	405	471	531	225	389	433	474	470	671	459	576	596	5,700	876	876	876	876
USBR Basinwide Program	500	6,333	10,858	16,783	21,459	11,891	15,885	12,427	13,090	10,755	12,540	13,870	11,401	24,629	182,421	9,446	9,446	9,446	9,446
Subtotal (USBR Program)	500	6,333	16,794	21,050	27,896	15,109	20,573	16,111	16,986	13,944	17,117	18,337	16,417	30,105	237,272	15,143	15,143	15,143	15,143
USDA Program	0	4,428	4,155	5,995	8,355	5,785	13,022	19,763	27,975	25,681	28,962	28,238	25,008	24,227	221,594	25,714	24,286	22,857	22,857
BLM (no Basin Funds)	800	800	800	800	800	800	800	800	800	800	751	800	800	800	11,151	800	800	800	800
Total	1,300	11,561	21,749	27,845	37,051	21,694	34,395	36,674	45,761	40,425	46,830	47,375	42,225	55,132	470,017	41,657	40,228	38,800	38,800

APPROPRIATIONS EXPENDED ($1,000)

Unit	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Subtotal	2010	2011	2012	2013
Grand Valley O&M	0	0	2,525	689	860	646	993	885	739	668	1,125	1,007	876	1,320	12,333	1,417	1,417	1,417	1,417
Paradox Valley O&M	0	0	1,375	1,707	2,493	2,016	2,027	1,516	1,780	1,918	1,827	1,975	2,378	2,341	23,353	2,199	2,199	2,199	2,199
Lower Gunnison O&M	0	0	401	320	319	331	179	0	0	0	0	0	0	0	1,550				
McElmo Creek (Dolores) O&M	0	0	405	340	358	225	251	366	343	448	527	293	392	422	4,370	613	613	613	613
USBR Basinwide Program	500	3,464	7,600	12,541	12,044	10,791	11,498	8,548	9,547	8,270	8,474	8,948	7,984	17,281	127,490	6,612	6,612	6,612	6,612
Subtotal (USBR Program)	500	3,464	12,306	15,597	16,074	14,009	14,948	11,315	12,409	11,304	11,953	12,223	11,630	21,364	169,096	10,841	10,841	10,841	10,841
USDA Program	0	3,100	2,894	4,016	3,805	5,785	10,451	12,714	19,488	19,798	19,661	19,667	17,611	16,919	155,909	18,000	17,000	16,000	16,000
Total	500	6,564	15,200	19,613	19,879	19,794	25,399	24,029	31,897	31,102	31,614	31,890	29,241	38,283	325,005	28,841	27,841	26,841	26,841

UPPER BASIN FUND COST SHARE PAYMENTS ($1,000)

Unit	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Subtotal	2010	2011	2012	2013
Grand Valley O&M	0	0	184	33	91	0	45	20	33	32	55	50	44	68	655	71	71	71	71
Paradox Valley O&M	0	0	0	109	208	0	99	49	102	101	88	104	134	115	1,109	110	110	110	110
Lower Gunnison O&M	0	0	0	20	42	0	21	0	0	0	0	0	0	0	83				
McElmo Creek (Dolores) O&M	0	0	0	20	26	0	21	5	20	22	22	25	25	20	206	39	39	39	39
USBR Basinwide Program	0	446	489	739	1,540	0	658	314	531	531	615	1,676	513	1,052	9,104	425	425	425	425
Subtotal (USBR Program)	0	446	673	921	1,907	0	844	388	686	686	780	1,855	716	1,255	11,157	645	645	645	645
USDA Projects	0	199	189	296	682	0	386	572	1,274	1,256	1,286	1,286	1,132	1,145	9,703	1,157	1,093	1,029	1,029
Total Payment	0	645	862	1,217	2,589	0	1,230	960	1,960	1,942	2,066	3,141	1,848	2,400	20,860	1,802	1,738	1,674	1,674

LOWER BASIN FUND COST SHARE PAYMENTS ($1,000)

Unit	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Subtotal	2010	2011	2012	2013
Grand Valley O&M	0	0	1,046	186	446	0	255	223	189	0	311	283	308	373	3,620	401	401	401	401
Paradox Valley O&M	0	0	0	616	1,210	0	559	558	579	0	500	589	700	663	5,974	623	623	623	623
Lower Gunnison O&M	0	0	0	116	237	0	121	0	0	0	0	0	0	0	474				
McElmo Creek (Dolores) O&M	0	0	0	111	147	0	117	62	111	0	122	141	159	154	1,124	223	223	223	223
USBR Basinwide Program	0	2,423	2,769	3,503	7,875	1,100	3,729	3,565	3,012	1,954	3,451	3,246	2,904	6,296	45,827	2,409	2,409	2,409	2,409
Subtotal (USBR Program)	0	2,423	3,815	4,532	9,915	1,100	4,781	4,408	3,891	1,954	4,384	4,259	4,071	7,486	57,019	3,656	3,656	3,656	3,656
USDA Projects	0	1,129	1,072	1,683	3,868	0	2,185	6,477	7,213	4,627	8,015	7,285	6,265	6,163	55,982	6,557	6,193	5,829	5,829
Total	0	3,552	4,887	6,215	13,783	1,100	6,966	10,885	11,104	6,581	12,399	11,544	10,336	13,649	113,001	10,214	9,849	9,485	9,485

LOWER COLORADO RIVER BASIN DEVELOPMENT FUND (LCRBDF)
SURCHARGE FUND STATUS (2 1/2 MILLS)

as of 9/30/09

	YEAR	A COLLECTIONS 1/	B COLLECTIONS 4/	C DEFICIENCY PAYMENTS 2/	D SALINITY TRANSFERS TO TREASURY 2/	E SALINITY PAYMENTS UC REGION 2/	(A + B - C - D - E) F CUMULATIVE BALANCE IN LCRBDF V42 FUNDS
	1987	1,540,704.99		0.00	0.00		1,540,704.99
	1988	9,359,325.00		1,532,868.00	56,609.00		9,310,552.99
	1989	8,442,385.00		1,532,868.00	671,012.00		15,549,057.99
	1990	8,899,347.50		1,532,868.00	967,576.00		21,947,961.49
	1991	8,055,137.50		11,532,868.00	2,424,156.00		16,046,074.99
	1992	7,622,747.50		1,532,868.00	3,341,252.00		18,794,702.49
	1993	6,960,422.50		1,532,868.00	5,502,160.00		18,720,096.99
	1994	8,830,220.00		1,532,868.00	7,853,582.00		18,163,866.99
	1995	8,212,818.42		1,532,868.00	5,833,699.00		19,010,118.41
	1996	9,644,684.16		1,532,868.00	4,575,630.00		22,546,304.57
	1997	9,172,878.54		1,532,868.00	1,370,282.00	3,552,000.00	25,264,033.11
	1998	10,398,523.94		1,532,868.00	2,279,925.00	4,887,000.00	26,962,764.05
	1999	10,908,408.29		730,073.25	1,180,267.00	6,215,000.00	29,745,832.09
	2000	10,410,325.45		0.00	1,034,975.00	13,783,000.00	25,338,182.54
3/	2001	10,255,846.46		0.00	1,034,975.00	1,100,000.00	33,459,054.00
	2002	8,674,271.24		0.00	1,029,973.00	6,966,000.00	34,137,352.24
	2003	8,202,776.78		0.00	1,032,474.00	10,885,000.00	30,422,655.02
	2004	8,307,425.37		0.00	1,032,474.00	11,104,000.00	26,593,606.39
	2005	6,700,765.00	448,360.43	0.00	1,032,474.00	6,581,000.00	26,129,257.82
	2006	8,174,032.50	1,462,304.76	0.00	4,901,904.00	12,399,000.00	18,464,691.08
	2007	8,008,372.50	1,418,251.90	0.00	779,905.00	11,544,000.00	15,567,410.48
	2008	7,842,785.00	1,478,286.68	0.00	419,593.00	10,336,000.00	14,132,889.16
5/	2009	7,574,720.00	1,547,287.68	0.00	997,172.00	0.00	22,257,724.84
	TOTALS	192,198,923.64	6,354,491.45	27,591,621.25	49,352,069.00	99,352,000.00	22,257,724.84

1/ Amounts collected into Colorado River Dam Fund and Transferred to LCRBDF

2/ Payments from LCRBDF

3/ Salinity payment for 2001 was estimated. A trueup was received in 2002 which was $2,501.00 less than was actually paid. Adjusted from 2002 estimate.

4/ Amounts collected into Parker Davis and Transferred to LCRBDF

5/ UC did not request any funds for cost-sharing due to existing & sufficient unliquidated obligations in place

U:\1-WORK\1-Salinity\1-Finance\1-Repayment\LCRBDF\LCRBDF 09

COLORADO RIVER BASIN Y CONTROL PROGRAM TITLE II

Lower Colorado River Basin Development Fund

October 21, 2009

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
	Repayment																		
				Grand Valley															
	Paradox Valley Unit			Construction Completed								Las Vegas	Lower Gunnison		McElmo Creek		USDA	Transfer to	
Year	Well	Facilities	O&M	Sep-89	Sep-92	Sep-93	Sep-97	Sep-98	Sep-99	Total	O&M	Wash	Construction	O&M	Construction	O&M	NRCS	Treasury	Year
1988											11,410				17,402		27,797	56,609	1988
1989			5,511								14,424				160,515		490,562	671,012	1989
1990			25,242	165,039						165,039	5,178				176,194		595,923	967,576	1990
1991			40,744	165,366						165,366	20,826		683,908		685,579		827,733	2,424,156	1991
1992			54,736	167,566						167,566	24,461		1,018,031		1,022,056	12,857	1,041,545	3,341,252	1992
1993			100,304	170,951	30,755					201,706	25,037		1,800,250	58,374	1,791,857	13,151	1,511,481	5,502,160	1993
1994			90,727	170,982	33,049	65,779				269,810	62,403	36,690	1,481,236	62,335	3,508,286	29,635	2,312,460	7,853,582	1994
1995			104,588	170,982	34,063	66,016				271,061	12,198	7,338	1,265,024	89,901	2,263,383	10,861	1,809,345	5,833,699	1995
1996			523,452	318,081	35,023	66,024				419,128	172,501	11,439	151,911	150,538	407,689	97,918	2,641,054	4,575,630	1996
1997			156,978	23,861	35,347	66,033				125,241	51,373	3,237	45,361	45,222	122,133	29,592	791,145	1,370,282	1997
1998			307,790	171,053	35,713	66,038	134,568	313,270		720,642	108,753	7,338	382,343	61,102	616,036	75,921		2,279,925	1998
1999			52,534	171,053	39,952	66,043	134,689	491,475	58,629	961,841	105,987	7,338	-256		52,823			1,180,267	1999
2000				363,811	39,254	17,978	23,822	540,162	40,109	1,025,136		7,338	1,362		1,139			1,034,975	2000
2001				365,715	39,498	18,064	24,536	512,562	64,761	1,025,136		7,338	1,362		1,139			1,034,975	2001
2002				366,384	39,540	18,152	24,053	523,997	57,847	1,029,973								1,029,973	2002
2003				363,833	41,792	17,978	23,822	523,964	53,747	1,025,136		7,338						1,032,474	2003
2004				363,890	39,275	17,978	23,822	521,838	58,333	1,025,136		7,338						1,032,474	2004
2005				363,376	39,276	17,978	23,822	521,921	58,763	1,025,136		7,338						1,032,474	2005
2006	2,655,420	1,214,010		363,376	39,276	17,978	23,822	521,921	58,763	1,025,136		7,338						4,901,904	2006
2007	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338	-383,526		166,259			779,905	2007
2008	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338			-577,579			419,593	2008
2009	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2009
Subtotal	3,448,860	1,578,213	1,462,606	5,507,869	642,476	552,516	491,940	4,583,352	681,895	12,460,048	614,551	139,422	6,447,006	467,472	10,992,490	269,935	12,049,045	49,352,069	
2010	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2010
2011	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2011
2012	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2012
2013	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2013
2014	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2014
2015	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2015
2016	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2016
2017	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2017
2018	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2018
2019	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2019
2020	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2020
2021	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2021
2022	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2022
2023	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2023
2024	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2024
2025	264,480	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,172	2025
2026	264,482	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						997,174	2026
2027	0	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						732,692	2027
2028	0	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						732,692	2028
2029	0	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						732,692	2029
2030	0	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						732,692	2030
2031	0	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						732,692	2031
2032	0	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						732,692	2032
2033	0	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						732,692	2033
2034	0	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						732,692	2034
2035	0	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						732,692	2035
2036	0	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						732,692	2036
2037	0	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						732,692	2037
2038	0	121,401		420,850	40,221	10,159	18,328	37,414	76,981	603,953		7,338						732,692	2038
2039	0	121,401		420,862	40,221	10,159	18,328	37,414	76,981	603,965		7,338						732,704	2039
2040	0	121,401			40,221	10,159	18,328	37,414	76,981	183,103		7,335						311,839	2040
2041	0	121,401			40,221	10,159	18,328	37,414	76,981	183,103								304,504	2041
2042	0	121,401			40,216	10,159	18,328	37,414	76,981	183,098								304,499	2042
2043	0	121,401				10,143	18,328	37,414	76,981	142,866								264,267	2043
2044	0	121,401					18,328	37,414	76,981	132,723								254,124	2044
2045	0	121,401					18,328	37,414	76,981	132,723								254,124	2045
2046	0	121,422					18,328	37,414	76,981	132,723								254,145	2046
2047	0	0					18,330	37,394	76,981	132,705								132,705	2047
2048									76,998	76,998								76,998	2048
Total	7,945,022	6,070,071	1,462,606	18,133,381	1,969,764	897,906	1,188,406	6,005,064	3,684,171	31,978,692	614,551	366,897	6,447,006	467,472	10,414,911	269,935	12,049,045	77,986,208	

COLORADO RIVER BASIN SALINITY CONTROL PROGRAM TITLE II

Lower Colorado River Basin Development Fund

October 21, 2009

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
					Up-front Cost Sharing											
										NRCS SCP Cost Share						
Year	Revenues Hoover	Parker & Davis	Deficiency Payments	Repayment Transfer to Treasury	Paradox Valley O&M	Grand Valley O&M	McElmo Creek O&M	Lower Gunnison O&M	Basinwide SCP	Cost Share Earned NRCS SCP	Amount in Reserve for Parallel Program	Requested For Parallel Program	Actual Transfer to UC Region	Projected LCRBDF Transfer to UC Region	Actual LCRBDF Balance Available	Projected LCRBDF Balance Available
1987	1,540,705														1,540,705	
1988	9,359,325		1,532,868	56,609											9,310,553	
1989	8,442,385		1,532,868	671,012											15,549,058	
1990	8,899,348		1,532,868	967,576											21,947,962	
1991	8,055,138		11,532,868	2,424,156											16,046,075	
1992	7,622,748		1,532,868	3,341,252											18,794,703	
1993	6,960,423		1,532,868	5,502,160											18,720,097	
1994	8,830,220		1,532,868	7,853,582											18,163,867	
1995	8,212,818		1,532,868	5,833,699											19,010,118	
1996	9,644,684		1,532,868	4,575,630											22,546,305	
1997	9,172,879		1,532,868	1,370,282					2,423,000	1,129,000		1,129,000	3,552,000		25,264,033	
1998	10,398,524		1,532,868	2,279,925		1,046,000			2,769,000	1,072,000		1,072,000	4,887,000		26,962,764	
1999	10,908,408		730,073	1,180,267	616,000	186,000	111,000	116,000	3,503,000	1,683,000		1,683,000	6,215,000		29,745,832	
2000	10,410,325			1,034,975	1,210,000	446,000	147,000	237,000	7,875,000	3,868,000		3,868,000	13,783,000		25,338,183	
2001	10,255,846			1,034,975	0	0	0	0	1,100,000	0		0	1,100,000		33,459,054	
2002	8,674,271			1,029,973	559,000	255,000	117,000	121,000	3,729,000	2,185,000		2,165,000	6,966,000		34,137,353	
2003	8,202,777			1,032,474	558,000	223,000	62,000		3,565,000	6,477,000		6,477,000	10,885,000		30,422,655	
2004	8,307,425			1,032,474	579,000	189,000	111,000		3,012,000	7,213,000		7,213,000	11,104,000		26,593,607	
2005	6,700,765	448,360		1,032,474	0	0	0		1,954,000	4,627,000		4,627,000	6,581,000		26,129,258	
2006	8,174,033	1,462,305		4,901,904	500,000	311,000	122,000		3,451,000	8,015,000		8,015,000	12,399,000		18,464,691	
2007	8,008,372	1,418,252		779,905	589,000	283,000	141,000		3,246,000	7,285,000		7,285,000	11,544,000		15,567,410	
2008	7,842,785	1,478,286		419,593	700,000	308,000	159,000		2,904,000	6,265,000		6,265,000	10,336,000		14,132,888	
2009	7,574,720	1,547,288		997,172	1/ 663,000	1/ 373,000	1/ 154,000		1/ 6,296,000	1/ 6,163,000	3/ 7,516,671	2,539,634	1/ 0	2/ 13,549,000	22,257,724	
Subtotal	192,198,923	6,354,491	27,591,621	49,352,069	5,974,000	3,620,000	1,124,000	474,000	45,827,000	55,982,000			99,352,000			
2010	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	6,557,000	3,147,360	3,409,640		4/ 8,071,808		21,410,752
2011	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	5,828,000	2,797,440	3,030,560		4/ 9,379,568		20,156,020
2012	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	5,828,000	2,797,440	3,030,560		4/ 10,078,928		18,201,928
2013	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	5,465,000	2,623,200	2,841,800		4/ 10,589,528		15,737,236
2014	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	5,100,000	2,448,000	2,652,000		4/ 9,151,360		14,710,711
2015	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	5,100,000	2,448,000	2,652,000		4/ 8,976,520		13,859,027
2016	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	4,735,000	2,272,800	2,462,200		4/ 8,699,360		13,284,503
2017	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	4,372,000	2,098,560	2,273,440		4/ 8,379,440		13,029,898
2018	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	4,372,000	2,098,560	2,273,440		4/ 8,248,280		12,906,454
2019	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	4,007,000	1,923,360	2,083,640		4/ 7,971,120		13,060,170
2020	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	3,643,000	1,748,640	1,894,360		4/ 7,650,880		13,534,325
2021	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	3,643,000	1,748,640	1,894,360		4/ 7,519,640		14,139,521
2022	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	3,643,000	1,748,640	1,894,360		4/ 7,432,160		14,832,197
2023	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	3,643,000	1,748,640	1,894,360		4/ 7,344,680		15,612,352
2024	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	3,643,000	1,748,640	1,894,360		4/ 7,301,000		16,436,168
2025	7,574,720	1,547,288		997,172	623,000	402,000	224,000		2,409,000	3,643,001	1,748,640	1,894,361		4/ 7,301,001		17,260,023
2026	7,574,720	1,547,288		997,174	623,000	402,000	224,000							4/ 2,997,640		22,387,217
2027	7,574,720	1,547,288		732,692	623,000	402,000	224,000							4/ 2,560,480		28,216,052
2028	7,574,720	1,547,288		732,692	623,000	402,000	224,000							4/ 2,123,320		34,482,048
2029	7,574,720	1,547,288		732,692	623,000	402,000	224,000							4/ 1,686,160		41,185,203
2030	7,574,720	1,547,288		732,692	623,000	402,000	224,000							1,249,000		48,325,619
2031	7,574,720	1,547,288		732,692	623,000	402,000	224,000							1,249,000		55,465,835
2032	7,574,720	1,547,288		732,692	623,000	402,000	224,000							1,249,000		62,606,150
2033	7,574,720	1,547,288		732,692	623,000	402,000	224,000							1,249,000		69,746,466
2034	7,574,720	1,547,288		732,692	623,000	402,000	224,000							1,249,000		76,886,782
2035	7,574,720	1,547,288		732,692	623,000	402,000	224,000							1,249,000		84,027,098
2036	7,574,720	1,547,288		732,692	623,000	402,000	224,000							1,249,000		91,167,413
2037	7,574,720	1,547,288		732,692	623,000	402,000	224,000							1,249,000		98,307,729
2038	7,574,720	1,547,288		732,692	623,000	402,000	224,000							1,249,000		105,448,045
2039	7,574,720	1,547,288		732,704	623,000	402,000	224,000							1,249,000		112,588,348
2040	7,574,720	1,547,288		311,839	623,000	402,000	224,000							1,249,000		120,149,517
2041	7,574,720	1,547,288		304,504	623,000	402,000	224,000							1,249,000		127,716,021
2042	7,574,720	1,547,288		304,499	623,000	402,000	224,000							1,249,000		135,285,529
2043	7,574,720	1,547,288		264,267	623,000	402,000	224,000							1,249,000		142,895,270
2044	7,574,720	1,547,288		254,124	623,000	402,000	224,000							1,249,000		150,514,154
2045	7,574,720	1,547,288		254,124	623,000	402,000	224,000							1,249,000		158,133,037
2046	7,574,720	1,547,288		254,145	623,000	402,000	224,000							1,240,000		165,751,900
2047	7,574,720	1,547,288		132,705	623,000	402,000	224,000							1,249,000		173,492,203
2048	7,574,720	1,547,288		76,998	623,000	402,000	224,000							1,249,000		181,288,212
Total	487,613,003	66,698,710	27,591,621	77,986,208	30,271,000	19,298,000	9,860,000	474,000	84,371,000	129,204,001	42,763,231	86,440,770		247,996,072		

1/ Upfront cost sharing was created but not requested by the UC Region this year. Cost Share obligations were met by funds already sitting in the UC Region account, mostly from Unliqiudated Obligations in the Parallel Program.

2/ For information purposes, this is the total amount that could have been, but not requested by the UC Region. It includes cost-sharing of $4.8 M for ARRA funds.

3/ This amount includes $2,516,671 held in reserve in 2009 and $5,100,00 deobligated to reserve from cooperative agreements with UDAF and CSCB.

4/ Includes 25% per year for 4 years of each amount held in Reserve beginning the year after held in Reserve.

COLORADO RIVER BASIN SALINITY CONTROL PROGRAM TITLE II

Upper Colorado River Basin Fund

October 21, 2009

A	B	C	D	E	F	G	H	I	J
	Up-front Cost Sharing								
Fiscal Year	Paradox Valley O&M	Grand Valley O&M	McElmo Creek (Dolores) O&M	Lower Gunnison O&M	Basinwide SCP	USDA NRCS SCP	**Total Transfer to UC Region**	**Total Repayment Transfer to Treasury**	**Total Annual Requirement**
1987								6,918	6,918
1988								90,088	90,088
1989								110,531	110,531
1990								156,936	156,936
1991								200,047	200,047
1992								301,475	301,475
1993								451,325	451,325
1994								357,687	357,687
1995								1,934,454	1,934,454
1996								2,750,148	2,750,148
1997					446,000	199,000	645,000	285,643	930,643
1998		184,000			489,000	189,000	862,000	135,666	997,666
1999	109,000	33,000	20,000	20,000	739,000	296,000	1,217,000	87,604	1,304,604
2000	208,000	91,000	26,000	42,000	1,540,000	682,000	2,589,000	0	2,589,000
2001	0	0	0	0	0	0	0	0	0
2002	99,000	45,000	21,000	21,000	658,000	386,000	1,230,000	0	1,230,000
2003	49,000	20,000	5,000		314,000	572,000	960,000	0	960,000
2004	102,000	33,000	20,000		531,000	1,274,000	1,960,000	0	1,960,000
2005	101,000	32,000	22,000		531,000	1,256,000	1,942,000	0	1,942,000
2006	88,000	55,000	22,000		607,000	1,416,000	2,188,000	0	2,188,000
2007	104,000	50,000	25,000		1,676,000 1/	1,286,000	3,141,000 2/	0	3,141,000
2008	134,000	44,000	25,000		513,000	1,132,000	1,848,000	0	1,848,000
2009	115,000	68,000	20,000		1,052,000	1,145,000	2,400,000	0	2,400,000
Subtotal	1,109,000	655,000	206,000	83,000	9,096,000	9,833,000	20,982,000	6,868,522	27,850,522
2010	110,000	71,000	39,000		425,000	1,157,000	1,802,000	0	1,802,000
2011	110,000	71,000	39,000		425,000	1,029,000	1,674,000	0	1,674,000
2012	110,000	71,000	39,000		425,000	1,029,000	1,674,000	0	1,674,000
2013	110,000	71,000	39,000		425,000	964,000	1,609,000	0	1,609,000
2014	110,000	71,000	39,000		425,000	900,000	1,545,000	0	1,545,000
2015	110,000	71,000	39,000		425,000	900,000	1,545,000	0	1,545,000
2016	110,000	71,000	39,000		425,000	836,000	1,481,000	0	1,481,000
2017	110,000	71,000	39,000		425,000	771,000	1,416,000	0	1,416,000
2018	110,000	71,000	39,000		425,000	771,000	1,416,000	0	1,416,000
2019	110,000	71,000	39,000		425,000	707,000	1,352,000	0	1,352,000
2020	110,000	71,000	39,000		425,000	643,000	1,288,000	0	1,288,000
2021	110,000	71,000	39,000		425,000	643,000	1,288,000	0	1,288,000
2022	110,000	71,000	39,000		425,000	643,000	1,288,000	0	1,288,000
2023	110,000	71,000	39,000		425,000	643,000	1,288,000	0	1,288,000
2024	110,000	71,000	39,000		425,000	643,000	1,288,000	0	1,288,000
2025	110,000	71,000	39,000		425,000	643,000	1,288,000	0	1,288,000
2026	110,000	71,000	39,000				220,000	1,397,380	1,617,380
2027	110,000	71,000	39,000				220,000	0	220,000
2028	110,000	71,000	39,000				220,000	0	220,000
2029	110,000	71,000	39,000				220,000	0	220,000
2030	110,000	71,000	39,000				220,000	0	220,000
2031	110,000	71,000	39,000				220,000	0	220,000
2032	110,000	71,000	39,000				220,000	0	220,000
2033	110,000	71,000	39,000				220,000	0	220,000
2034	110,000	71,000	39,000				220,000	0	220,000
2035	110,000	71,000	39,000				220,000	0	220,000
2036	110,000	71,000	39,000				220,000	0	220,000
2037	110,000	71,000	39,000				220,000	0	220,000
2038	110,000	71,000	39,000				220,000	0	220,000
2039	110,000	71,000	39,000				220,000	3,200,008	3,420,008
2040	110,000	71,000	39,000				220,000	64,747	284,747
2041	110,000	71,000	39,000				220,000	0	220,000
2042	110,000	71,000	39,000				220,000	347,605	567,605
2043	110,000	71,000	39,000				220,000	158,454	378,454
2044	110,000	71,000	39,000				220,000	0	220,000
2045	110,000	71,000	39,000				220,000	0	220,000
2046	110,000	71,000	39,000				220,000	1,071,189	1,291,189
2047	110,000	71,000	39,000				220,000	1,919,584	2,139,584
2048	110,000	71,000	39,000				220,000	0	220,000
Total	5,399,000	3,424,000	1,727,000	83,000	15,896,000	22,755,000	49,284,000	15,027,489	64,311,489

1/ In FY2003 $1,103,000 was transferred from the Upper Basin Fund, but was not transferred into the Salinity Program until FY 2007. The total amount was accounted for in the Basinwide Program portion.

2/ The actual amount transferred from the Upper Basin Fund to the UC Region for the Salinity Program was $2,038,000, of which $573,000 was for the Basinwide Program. Please see footnote 1/ for the explanation of the difference.

COLORADO RIVER BASIN / CONTROL PROGRAM TITLE II

Upper Colorauu River Basin Fund

October 21, 2009

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
	Repayment																		
	Paradox Valley Unit			Grand Valley								Las Vegas Wash	Lower Gunnison		McElmo Creek (Dolores Project)		USDA NRCS	Total Transfer to Treasury	
				Construction Completed															
Fiscal Year	Well	Facilities	O&M	Sep-89	Sep-92	Sep-93	Sep-97	Sep-98	Sep-99	Total	O&M		Construction	O&M	Construction	O&M			Year
1987											2,013						4,905	6,918	1987
1988			973								2,545						86,570	90,088	1988
1989			4,454								914						105,163	110,531	1989
1990			7,190								3,675						146,071	156,936	1990
1991			9,659								4,317					2,269	183,802	200,047	1991
1992			17,701								4,418			10,301		2,321	266,734	301,475	1992
1993			16,011								11,012			11,000		5,230	408,072	451,325	1993
1994			18,457								2,152			15,865		1,917	319,296	357,687	1994
1995			29,749								14,647		1,405,078	16,021		8,845	460,114	1,934,454	1995
1996			90,326								24,860		-7,680	18,525	2,464,892	13,657	145,568	2,750,148	1996
1997			80,337								22,645		675	18,774	21,829	12,613	128,770	285,643	1997
1998			70,676								18,704		-43	19,188	10,658	16,483		135,666	1998
1999													59,331		28,273			87,604	1999
2000																		0	2000
2001																		0	2001
2002																		0	2002
2003																		0	2003
2004																		0	2004
2005																		0	2005
2006																		0	2006
2007																		0	2007
2008	0	0		0	0	0	0	0	0	0								0	2008
2009	0	0		0	0	0	0	0	0	0								0	2009
Subtotal	0	0	345,533	0	0	0	0	0	0	0	111,902	0	1,457,361	109,674	2,525,652	63,335	2,255,065	6,868,522	
2010	0	0		0	0	0	0	0	0	0								0	2010
2011	0	0		0	0	0	0	0	0	0								0	2011
2012	0	0		0	0	0	0	0	0	0								0	2012
2013	0	0		0	0	0	0	0	0	0								0	2013
2014	0	0		0	0	0	0	0	0	0								0	2014
2015	0	0		0	0	0	0	0	0	0								0	2015
2016	0	0		0	0	0	0	0	0	0								0	2016
2017	0	0		0	0	0	0	0	0	0								0	2017
2018	0	0		0	0	0	0	0	0	0								0	2018
2019	0	0		0	0	0	0	0	0	0								0	2019
2020	0	0		0	0	0	0	0	0	0								0	2020
2021	0	0		0	0	0	0	0	0	0								0	2021
2022	0	0		0	0	0	0	0	0	0								0	2022
2023	0	0		0	0	0	0	0	0	0								0	2023
2024	0	0		0	0	0	0	0	0	0								0	2024
2025	0	0		0	0	0	0	0	0	0								0	2025
2026	1,402,063	0		0	0	0	0	0	0	0			-421		-4,262			1,397,380	2026
2027		0		0	0	0	0	0	0	0								0	2027
2028		0		0	0	0	0	0	0	0								0	2028
2029		0		0	0	0	0	0	0	0								0	2029
2030		0		0	0	0	0	0	0	0								0	2030
2031		0		0	0	0	0	0	0	0								0	2031
2032		0		0	0	0	0	0	0	0								0	2032
2033		0		0	0	0	0	0	0	0								0	2033
2034		0		0	0	0	0	0	0	0								0	2034
2035		0		0	0	0	0	0	0	0								0	2035
2036		0		0	0	0	0	0	0	0								0	2036
2037		0		0	0	0	0	0	0	0								0	2037
2038		0		0	0	0	0	0	0	0								0	2038
2039		0		3,200,008	0	0	0	0	0	3,200,008								3,200,008	2039
2040		0			0	0	0	0	0	0		64,747						64,747	2040
2041		0			0	0	0	0	0	0								0	2041
2042		0			347,605	0	0	0	0	347,605								347,605	2042
2043		0				158,454	0	0	0	158,454								158,454	2043
2044		0					0	0	0	0								0	2044
2045		0					0	0	0	0								0	2045
2046		1,071,189					0	0	0	0								1,071,189	2046
2047							209,719	1,059,717	650,148	1,919,584								1,919,584	2047
2048										0									2048
Total	1,402,063	1,071,189	345,533	3,200,008	347,605	158,454	209,719	1,059,717	650,148	5,625,651	111,902	64,747	1,456,940	109,674	2,521,390	63,335	2,255,065	15,027,489	